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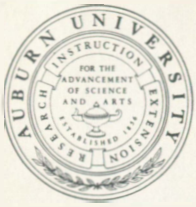

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BULLETIN 61

PART I

GEOLOGY AND COAL RESOURCES OF THE NORTHEAST PART OF THE COOSA COAL FIELD, ST. CLAIR COUNTY, ALABAMA

By
HOWARD E. ROTHROCK
Geologist, U. S. Geological Survey

Prepared by the
UNITED STATES GEOLOGICAL SURVEY
in cooperation with the
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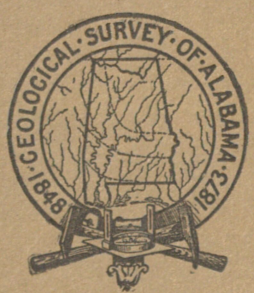

UNIVERSITY OF ALABAMA
1949

GEOLOGICAL SURVEY OF ALABAMA

WALTER B. JONES, State Geologist

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1949

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LETTER OF TRANSMITTAL

University, Alabama
June 7, 1949

Honorable James E. Folsom
Governor of Alabama
Montgomery, Alabama

Sir:

I have the honor to transmit herewith the manuscript of a report entitled, "Geology and Coal Resources of the Northeast Part of the Coosa Coal Field, St. Clair County, Alabama," by Howard E. Rothrock, of the United States Geological Survey. It is requested that it be printed as Bulletin 61 of the Geological Survey of Alabama.

Respectfully,

WALTER B. JONES

State Geologist

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GEOLOGY AND COAL RESOURCES OF THE NORTHEAST PART OF THE COOSA COAL FIELD, ST. CLAIR COUNTY, ALABAMA

ABSTRACT

The Coosa coal field is in the north central part of Alabama, a few miles east of Birmingham. The field is in the Coosa trough, a long, narrow, northeast-trending syncline comprising part of the Appalachian Mountains. The trough consists of several subsidiary depressions, two of which, the Coal City and Fairview basins in the northeast half of the field, are the subject of this report. Coal of bituminous rank has been mined in these areas intermittently during the past one hundred years, and much has been written about the mines and prospects. In spite of this long record of activity, little information has been available heretofore regarding the character and extent of the beds underground. In 1945 the Geological Survey and the Bureau of Mines of the United States Department of the Interior, at the request of the Geological Survey of Alabama, undertook to determine the reserves and the quality of the coal in the Coal City and Fairview basins as a means of furthering the development of these regions. The project involved detailed geologic mapping of the basins and core drilling, sampling and analysis of the coal beds. Field work was carried on from the fall of 1945 to the close of 1946.

The coal beds occur in the Pottsville formation which is the youngest lithified stratigraphic unit in the area covered by this report. The formations from oldest to youngest include the Frog Mountain sandstane of Lower or Middle Devonian age, the Chattanooga (?) shale of Devonian or Carboniferous age, the Fort Payne chert, Warsaw limestone, Gasper formation, Hartselle sandstone, Bangor limestone, Floyd shale and Parkwood formation of Mississippian age and the Pottsville formation of Pennsylvanian age.

The Coosa trough is a shallow syncline, the southeastern limb of which is cut longitudinally by several high angle thrust faults that mark the southeast borders of the coal basins. The names Black Ankle, Coal City, and Fairview faults are proposed for these faults in the mapped area. The bottoms of the

coal basins are cut by transverse faults, many of which branch from the longitudinal faults. These transverse faults are most numerous in the northeastern part of the Coal City basin, the deepest part of the Coosa trough in this area. They have affected mining adversely by tending to limit the individual operations to the fault block in which mining was begun.

Fourteen of the twenty or more coal beds in the area have been named. From the oldest to the youngest they are known as the Lower Chapman, Upper Chapman, New, Fairview, Higginbotham, Gann, Brown, Bibby, Marion, Broken Arrow, Inman, Coal City, Brewer, and Hammond beds. Most of these beds have yielded coal for domestic use, but the following six named in the approximate order of their past importance have been mined chiefly for making coke and generating steam: the Coal City, Broken Arrow, Marion, Inman, Hammond, and Fairview beds. The areas of occurrence of all of the beds are described and sections along the outcrops and in the core drill holes are given. The Fairview bed in the Fairview basin contains the largest block of reserves consisting of 13,430,000 tons of coal in place. Other blocks of coal containing beds 20 inches or more thick aggregate additional reserves of 5,697,000 tons. Reserves of coal which are not minable under current conditions but may be utilized in the future were computed for beds ranging from 14 to 19 inches in thickness. The total amount of these reserves is 11,323,000 tons.

INTRODUCTION

Location

The Coosa coal field is in the north-central part of Alabama. It extends from a point 16 miles south of Birmingham northeastward for a distance of about 54 miles. The field is divided into several parts, known as the Cunningham, Yellow Leaf, Howard, Black Ankle — Coal City, Fairview, and Ragland basins.[1]

The area described in this report is in the northeastern part of the Coosa coal field in St. Clair County. (See fig. 1.) It includes the Coal City basin (redefined) and the Fairview basin. The settlement of Wattsville is near the center of the area. (See pl. 1.)

PLATE 1. Geologic map of a part of the Coosa coal field, and adjacent areas, St. Clair County, Alabama.
(See Part II—Bulletin 61)

Purpose of the investigation

The investigation upon which this report is based was undertaken in an effort to locate and define sources of coal for southern industry. Coking coal and steam coal have been obtained from relatively small mines in the Coal City and Fairview basins for approximately a century, and much has been recorded about the coal in these mines and along the outcrops of the coal beds. Outside of the mined areas, however, little was known regarding the thickness or extent of the coal underground. The purpose of the present investigation was to augment the surface data that has been collected, to determine the extent, thickness, and reserves of the coal beds underground, and to resurvey the geology as a guide for further development.

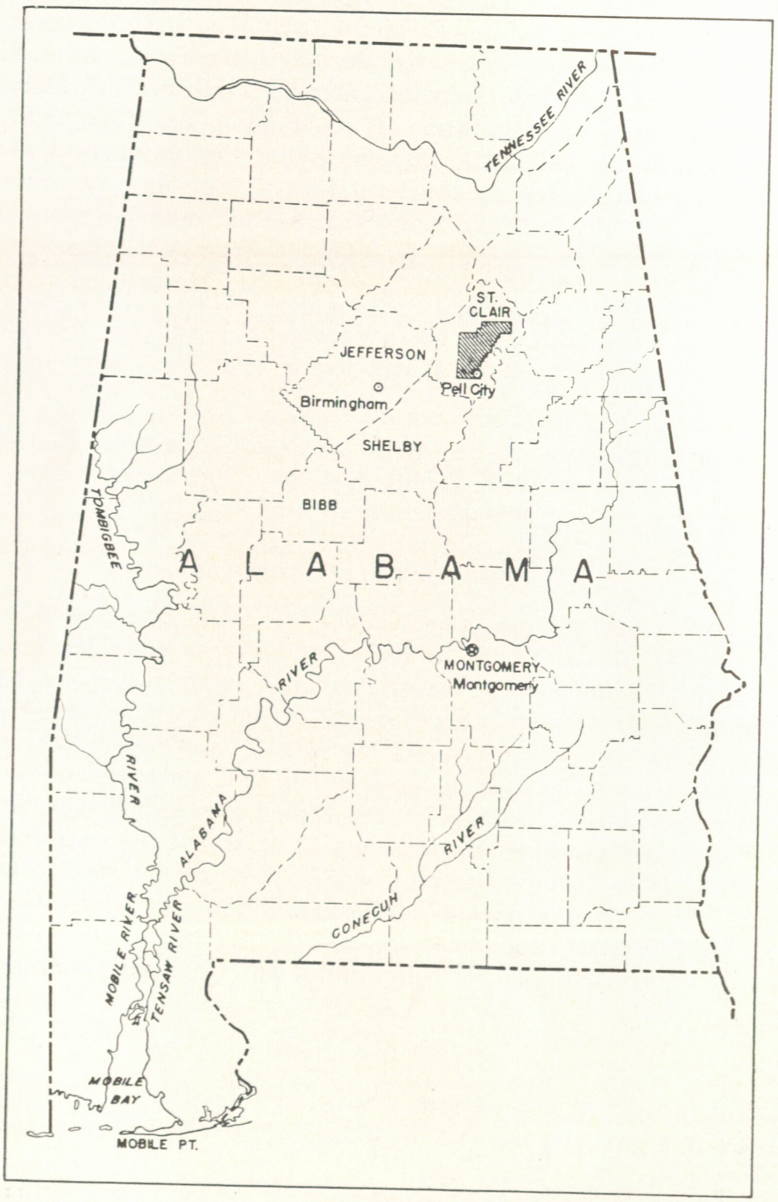
Previous investigations

The earliest accounts of coal in the area were by Michael Tuomey who described two workings on Broken Arrow Creek in

[1]Prouty, W. F., Map of the Coosa coal field: Geol. Survey of Alabama, 1912.

[2]Tuomey, Michael, First biennial report on the geology of Alabama: Geol. Survey of Alabama, p.. 75, 76, 1850.

FIGURE 1



INDEX MAP OF ALABAMA SHOWING LOCATION OF AREA COVERED BY THIS REPORT

the Coal City basin in 1850[2] and several additional workings in both basins in 1858.[3] The first comprehensive geological report, published in 1895, was by A. M. Gibson who described the general geology of the field, defined the individual basins, recorded the thickness of the coal in the scattered workings, named the coal beds, and gave a historical sketch of mining operations.[4] A geologic map of the field by W. F. Prouty, showing the general location of the coal beds and many details of structure, was published in 1912.[5] An estimate of the quantity of coal in the Coal City and Fairview basins, sometimes called the Wattsville basin, was made in 1929 by Walter B. Jones, and supported by detailed descriptions of the coal beds, and a map of the coal outcrops.[6]

Field work and methods

The project was undertaken by the Geological Survey and Bureau of Mines, United States Department of the Interior, with the cooperation of the Geological Survey of Alabama. Preliminary planning and geologic work was done in September, October, and part of December, 1945 by David A. Andrews of the Geological Survey. Core drilling was begun in the latter part of December, 1945 by the Pennsylvania Drilling Company, contractor, under the direction of the Bureau of Mines. Geologic mapping and correlation of core drill records were carried on by the writer from January to December 1946.

Mapping in the field was done on mosaics made from aerial photographs by the Soil Conservation Service. Points were located by stereoscope, and by compass and pace traverse. Only a few section-corner markers and other surveyed points were found, but in most of the area land lines indicating the location of such points were easily recognized on the photographs. Points so located were superimposed on plotted surveys of the area by

---

[3]Idem., Second biennial report on the geology of Alabama: Geol. Survey of Alabama, pp. 285, 286, 1858.

[4]Gibson, A. M., Report upon the Coosa coal field: Geol. Survey of Alabama Special Report 7, 1895.

[5]Prouty, W. F., Map of the Coosa coal field: Geol. Survey of Alabama, 1912.

[6]Jones, Walter B., Summary report on the Wattsville basin of the Coosa coal field: Geol. Survey of Alabama Circular 6, 1929.

the General Land Office, United States Department of the Interior, and adjustments were made where necessary.

Altitudes, measured by two surveying altimeters, were based on the United States Coast and Geodetic Survey benchmark (altitude 571.659 feet) near the southeast corner of the Wattsville station of the Seaboard Air Line Railroad. The altitude of each drill hole is the average of several readings and is thought to be within 5 feet of the true altitude. The readings at most other stations were checked at least once and are probably within 10 feet of the true altitude.

PLATE 2. Maps and structure sections of the Coal City and Fairview basins, Coosa coal field, St. Clair County, Alabama.
(See Part II—Bulletin 61)

The coal beds shown on plate 2 were located chiefly from the position of mines and prospect pits because outcrops or blooms of coal were very scarce. Where no trace of the bed could be found, its position was determined from nearby marker beds, such as the more persistent sandstones. Along the outcrop of the Fairview coal, pits were dug, and measurements and samples were taken at intervals that generally did not exceed half a mile. Mapping was extendted beyond the limits of the recognized coal fields to be sure that significant deposits had not been overlooked and to determine the regional structure of which the basins are a part. (See pl. 1.)

Carbonaceous material was classified as coal if it contained less than 20 percent of ash. This limit was determined by inspection or, in questionable cases, by emersion in carbon tetrachloride (specific gravity 1.595). If the material floated, it was classified as coal; if it sank, it was considered to be waste.

At many localities in the Coal City and Fairview basins the coal bed is composed of alternating layers of coal and waste. In this study, waste having a thickness of half an inch or less, was considered to be part of the coal, and waste having a thickness of more than half an inch was excluded from the coal bed. In places where a complete section of such a composite bed cannot be given, as on plate 3, the amount of coal and waste is

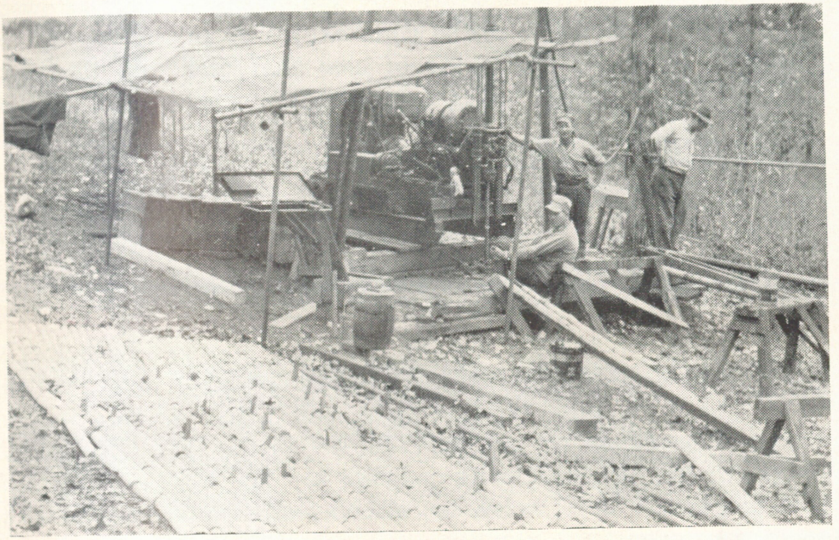


PLATE 11 A. Core drill at location no. 22 in the NW¼ sec. 15, T. 15 S., R. 4 E. Cores from the hole are in the foreground.

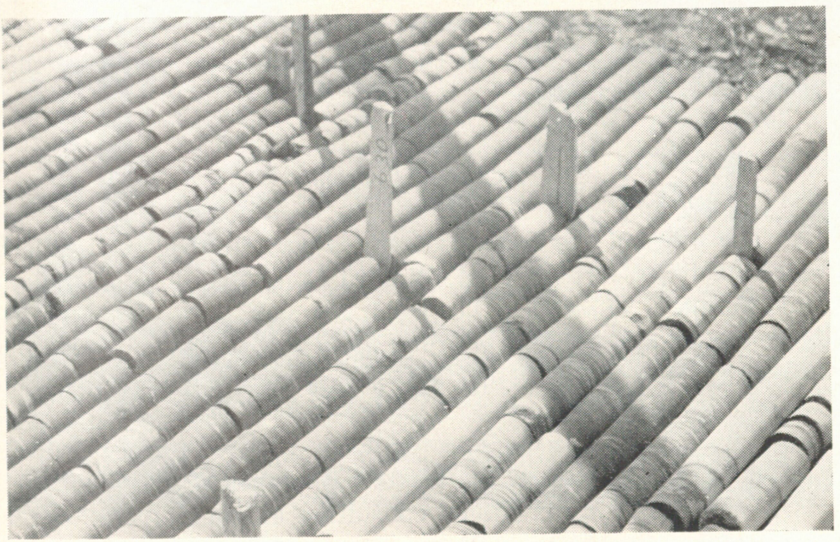


PLATE 11 B. Close-up of cores from hole no. 5 in the SE¼ sec. 15, T. 16 S., R. 3 E., showing method of indicating depths. Sandstone is light-gray, shale is dark-gray.

shown by two figures separated by a diagonal line as follows: 29/7. The first figure is the sum, expressed in inches, of the thickness of all of the layers of coal that make up the bed, and the second figure is the sum, also in inches, of all of the included layers or partings of waste. The total thickness of the bed is the sum of the two figures.

PLATE 3. Cross sections through core drill holes, Coosa coal field, St. Clair County, Alabama.
(See Part II—Bulletin 61)

The character of the coal beds underground was ascertained from cores (see pl. 11) cut in 24 diamond drill holes, which were spaced at intervals of approximately half a mile in the Fairview basin and at various distances in the Coal City basin. These are shown graphically on plate 3. The Bureau of Mines designated the drill holes by a composite number, such as 1-1-CA. The first number represents the order of drilling; the second indicates the section in which the hole is located; and the "CA" indicates the hole with the Coosa, Alabama, project. These composite numbers appear on the logs of the drill holes and on plate 3 to conform to Bureau practice, but in the interest of simplicity only the number representing the order of drilling is used on the other maps and plates in this report.

Acknowledgments

The work of the Bureau of Mines was directed in the field successively by Arthur Neal, Willard Cole, Theodore R. Jolley, and Joseph J. Shields. The coal samples were analyzed by H. L. Smith and H. M. Cooper in the Central Experiment Station of the Bureau of Mines at Pittsburgh, Pennsylvania.

Acknowledgment is made of the active support for the project and helpful suggestions by Walter B. Jones, State Geologist of Alabama, and Milton Fiess, consulting engineer. The writer is grateful also to Hobson Warren, Leonard Hammett, Theodore Hammett, and many other residents of the area for their help in locating old prospect pits and their fund of knowledge regarding the coal beds and mining operations.

PLATE 12 A. View southwestward down the valley of Inman Branch, showing moderate relief near the bottom of the Fairview basin. The cultivated field is on the dip slope of the standstone immediately beneath the Inman coal bed.

PLATE 12 B. View northeast from Shoal Creek Mountain to Beaver Creek Mountain. The jutting ledges of the Shades sandstone member of the Pottsville formation form the north-facing escarpment of the cuesta and the southward dip of the rock controls its gentler slope.

Topography, drainage, and accessibility

The Coal City and Fairview basins are in the southeastern part of the Appalachian Mountains. Within the central parts of the basins the relief is moderate, seldom exceeding 150 feet, (see pl. 12 A.), and the hills are irregular in shape. Toward the margins of the basins where the strata dip more steeply, the terrain is rugged, and the highlands are ridges. In most places along the southeastern margins of the basins the ridges, formed by resistant rocks dipping at high angles, are in approximate alignment and reflect the presence of faults that cut the basins. The ridges along the northwestern and northern margins of the basins are higher, crescentic in form, and occur in two parallel groups separated by Shoal Creek. They are notched by wind gaps, but within the area are not crossed by any stream. The highest altitudes in the area are on the ridges southeast of Shoal Creek, which are rugged (see pl. 12 B.), and cuestalike in profile. They include Backbone, Rock Pine, and Shoal Creek Mountains. Northwest of Shoal Creek the ridges, known as Oak Ridge and Beaver Creek Mountain (see pl. 1) are lower and more rounded.

The area is drained by tributaries of the Coosa River, which is nearest the coal fields at a point four miles east of Wattsville. The principal streams in the central part of the area are Trout, No Business, Soot, and Broken Arrow Creeks. Cane and Wolf Creeks drain the southwestern part of the area, and Shoal Creek, flowing northeast, lies north and northwest of the others.

Throughout the area erosion is controlled extensively by the structure and composition of the rocks. As a result, streams tend to follow the strike of the beds in areas where the rocks are inclined, to cut across the beds along some zones of faulting, and to meander in areas of flat-lying or soft homogeneous rock.

The area is readily accessible by railroad or highway. The Seaboard Air Line Railroad crosses it diagonally near its center, and the Southern Railway, passing through Cooks Springs and Pell City to the south, provides a second rail outlet. Paralleling the Southern Railway is U. S. Highway No. 78, which

FIGURE 2

cial Report 14, p. 149, 1926.

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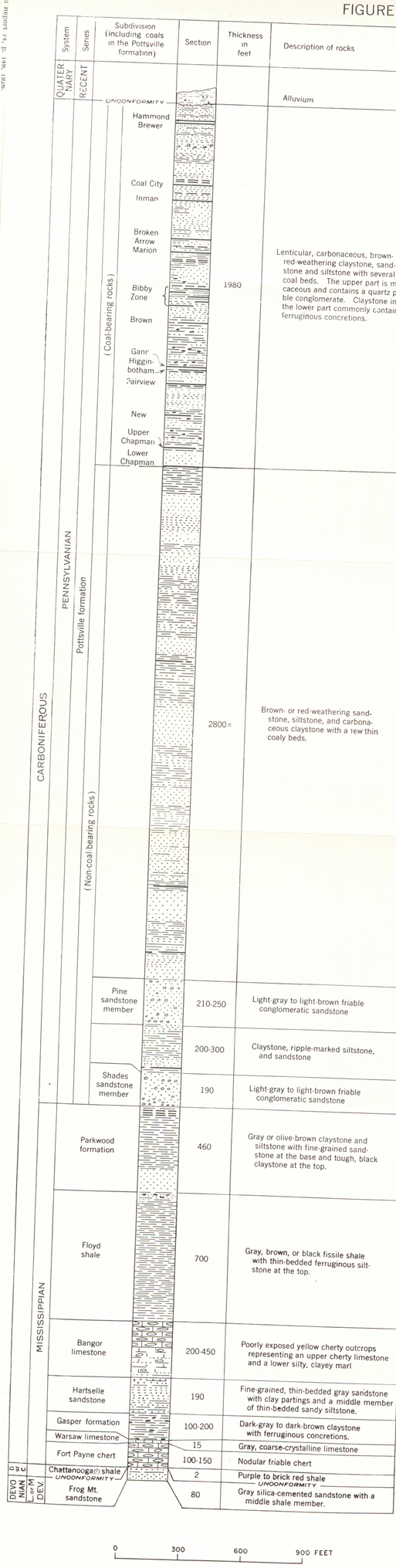
GSA Report 14, p. 149, 1926.

FIGURE 2



COLUMNAR SECTION OF ROCKS EXPOSED IN MAPPED AREA

tion mapped in the course of the present study. The base of the formation was not exposed in the area, but in Watkins Cut and in a highway cut two miles south of Odenville its top is in conformable contact with a purple or red shale unit assigned to the Chattanooga (?) shale. The Frog Mountain sandstone crops out as a narrow resistant band in Oak Ridge and Beaver Creek Mountain, and is well exposed in the gaps that notch these ridges. It consists of gray or reddish thin- to medium-bedded silicinate[8] sandstone and sandy shale, some of which is cherty. In Watkins Cut the oldest exposed unit of the formation is a medium-bedded, moderately coherent sandstone about 30 feet thick. It is composed chiefly of angular and subangular, well sorted, very fine grained, clear quartz grains. Minor constituents are white particles of kaolin and grains of dark minerals ranging in size from 0.2 to .02mm. Talus from a covered interval about 15 feet thick above this sandstone indicates that the next succeeding rock unit is shale. The top unit of the formation is about 25 feet thick and consists of medium-grained, gray silicinate sandstone that occurs in even-bedded layers ranging from a few inches to a foot in thickness. In McGrory Gap eight miles northeast of Watkins Cut, the formation consists of a sequence of thin dark sandstone and cherty shale beds.

According to Butts,[9] the Frog Mountain sandstone at the type locality in Frog Mountain, Cherokee County, is of Onondaga age, whereas in the area of this report, in St. Clair County, the rocks here referred to the Frog Mountain sandstone contain fossils of Hamilton age. Butts proposed that the rocks containing the younger fauna be termed the Ragland sandstone from exposures near Ragland, a few miles east of the mapped area. As the writer has examined the Devonian rocks for a distance of only a few miles along the outcrop, and as it was impossible to establish the limits of the faunal zones in the Devonian, the more general term, Frog Mountain sandstone, is retained in this report for the sandstone beds of Devonian age underlying the Chattanooga (?) shale.

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[8]This usage, which indicates a sandstone cemented with silica, follows recommendations in Appendix I in the Roptr of the Committee on Sedimentation, Division of Geology and Geography, National Research Council, pp. 17-8, May 2, 1936.

[9]Butts, Charles, The Devonian of Alabama, Am. Jour. Sci., 5th ser. vol. 14, pp. 365-380, Nov., 1927.

Devonian or Carboniferous system

The Chattanooga (?) shale, of Devonian or Carboniferous age, is generally poorly exposed in the area. It was seen in Watkins Cut, in the highway cut 2 miles south of Odenville, and in McGrory Gap, but a complete section was exposed only at the first locality. There is consists of a purple to red shale nearly two feet thick. Its laminations are parallel to the bedding of the underlying Frog Mountain sandstone and to the nodular beds of the overlying Fort Payne chert. Evidenct of erosion was not observed at either contact. The hiatus represented by the lower contact, however, includes almost all of Upper Devonian time and possibly some of the Middle Devonian.[10] Because of the thinness of the Chattanooga (?) shale, it is included with the map unit representing the Frog Mountain sandstone on plate 1.

Carboniferous system

The Carboniferous system is represented by rocks of the Mississippian and lower part of the Pennsylvanian series, aggregating about 7,500 feet in thickness. The unconformity between the two, which is very pronounced along the margins of the Appalachian trough, is indicated here only by local deposits of pebble conglomerate. No angular discordance is present.

Mississippian series

The formations of certain Mississippian age from oldest to youngest are the Fort Payne chert, Warsaw limestone, Gasper formation, Hartselle sandstone, Bangor limestone, Floyd shale, and Parkwood formation, the total thickness of which is about 2,000 feet. The sandstones and siltstones of the Parkwood formation mark the beginning of the transition from the marine deposition of the Mississippian epoch to the continental deposition of the Pennsylvanian epoch.

Fort Payne chert

The Fort Payne chert overlies the Chattanooga shale and underlies the Warsaw limestone. The lower contact is ap-

[10]Butts, Charles, Geology of Alabama: Geol. Survey of Alabama Special Report 14, p. 158, 1926.

parently conformable, but the nature of the upper contact could not be determined. The chert is exposed in many road cuts and quarries along Oak Ridge and Beaver Creek Mountain. On the outcrop it is a light-brown, friable, chert with a porous or stony texture, containing many fossils, including large Spirifers, and abundant large crinoid stem plates. It is thin-bedded in the upper part and thick-bedded and nodular in the lower part. It shatters easily into small flat-faced fragments, due to many incipient fractures intersecting at high angles, a characteristic that enhances its value as road-metal. The formation is about 100 feet thick in Watkins Cut and about 150 feet thick 11 miles northeast at Cox Gap in sec. 29, T. 14 S., R. 4 E. According to Butts,[11] fossils from the chert include forms of Keokuk, Burlington or Fern Glen, and late Kinderhook age.

Warsaw limestone

The Warsaw limestone was seen in place only in Watkins Cut where it lies above the Fort Payne chert and below the Gasper shale. The contacts were not exposed, but the proximity of the adjoining formations indicates that the thickness of the limestone does not exceed 15 feet. A small boulder of Warsaw limestone in the float at Cox Gap suggests that the formation is present along the entire length of Beaver Creek Mountain. The Warsaw limestone is gray, thick-bedded, coarsely-crystalline and very fossiliferous. Because of its thinness, it is included in the map unit representing the Gasper formation on plate 1.

Gasper formation

The Gasper formation is composed entirely of shale. In its type locality in Warren County, Kentucky, however, it is an oolitic limestone. Because of the softness of the shale, it is seldom exposed in natural outcrops but may be seen in some of the road cuts in the ridges northwest of Shoal Creek. The entire formation is exposed in the faulted syncline in Watkins Cut where it is about 200 feet thick. Partial exposures at McGrory and Cox Gaps suggest that the shale has thinned to about 100 feet in these localities. In all these exposures the Gasper formation is dark-gray or dark-brown claystone containing many small ferruginous lenses and thin ferruginous beds.

[11]Butts, Charles, op. cit., pp. 166, 167, 1926.

Hartselle sandstone

The Hartselle sandstone occurs as a ridge- or spur-making band along the southeastern sides of Oak Ridge and Beaver Creek Mountain. It is conformable above the Gasper formation and below the Bangor limestone, and according to Butts[12] is the equivalent of the Hardinsburg sandstone of the type section in the Mississippi and Ohio Valleys.

The lower part of the formation consists chiefly of sandy, brown-weathering siltstone that is easily eroded and usually is poorly exposed. The upper part of the formation is medium- to thin-bedded, regularly laminated, fine-grained, light-gray resistant sandstone. The best exposure of the formation in the area was in a cut in the Odenville-Pell City road (see pl. 13 B.) where the following section was measured:

PLATE 13 B. Part of the Hartselle sandstone in the road 2½ miles south of Odenville, showing the upper sandstone member and middle siltstone member. The dip is 30° southeast.

[12]Butts, Charles, op. cit., p. 195.

Section in road cut 2½ miles south of Odenville.

Hartselle sandstone:

	Feet
Sandstone, thick bedded, friable, red-weathering	8
Sandstone, white or light gray, fine grained, silicinate beds ranging from 6 to 18 inches in thickness with scattered shale partings	48
Siltstone with minor interbedded sandstone in beds ranging from one to several inches in thickness, scattered ferruginous lenses and claystone partings	98
Sandstone, thin bedded, argillaceous, fine grained, with claystone partings	22
Claystone	5
Sandstone, similar to the sandstone next above	8
Total thickness of Hartselle sandstone	189
Gasper formation:	
Claystone	20+

Bangor limestone

The Bangor limestone is composed of yellow-weathering cherty fossiliferous limestone and calcareous siltstone. The writer has identified this formation on the basis of its lithology and stratigraphic position above the Hartselle sandstone and below the Floyd shale.

The base of the Bangor limestone is exposed in the east end of Watkins Cut where it rests conformably on the Hartselle sandstone. It consists of a gray and purple silty claystone and marl unit 10 feet thick, overlain by a sandy calcareous siltstone unit also 10 feet thick. The siltstone is very fossiliferous, molds of bryozoan fronds and brachiopods being especially abundant but very poorly preserved. An *Archimedes* "screw," said to be plentiful in the Bangor limestone, and many small crinoid columnals were also found. A few specimens from this locality were examined by J. S. Williams of the U. S. Geological Survey who identified a fragment of a brachiopod closely resembling *Productus inflatus* McChesney and other fragments of brachiopods which suggested the genus *Diaphragmus*. Helen Duncan, also of the U. S. Geological Survey, identified fragments of bryozoans belonging to the genera *"Fenestella"* and *Polypora*.

The Bangor limestone is exposed for a distance of nearly a quarter of a mile along the Pell City-Ashville road near its

intersection with the road in Shoal Creek Valley, 8 miles northeast of Watkins Cut. (See pl. 1.) Horn corals from the lower marly part of the formation, exposed both north and south of the road intersection, were identified by Duncan as belonging to the genus *Triplophyllites* and one *Caninia* cf *C. veryi* Greene. A species of *Chonetes* and two specimens of *Productus inflatus* McChesney from this locality were identified by Williams. The upper cherty part of the formation is exposed in a borrow pit adjoining the silty marls on the south. A collection from this locality contained, according to the same authorities, fragments of impressions or silicified remains of bryozoans suggesting the genera *Meekopora, Polypora,* and *"Fenestella"*; brachiopods suggesting various productoid types, including a possible *Diaphragmus* and several *Compositas*; and crinoid columnals. Williams' report on these collections states that they clearly imply that the formation is of Chester age, but do not justify closer age assignment.

The top of the formation, a thin-bedded oolitic chert, is exposed along the road north of Parker Mill in sec. 19, T. 14 S., R. 5 E. It is conformably overlain by Floyd shale.

The Bangor limestone is estimated to be 450 feet thick along the Pell City-Ashville highway and 200 feet thick near Watkins Cut.

Floyd shale

The Floyd shale lies above the Bangor limestone and below the Parkwood formation. It occurs in the bottom of Shoal Creek valley and forms the lower slopes on its southeast side. The Floyd shale thickens to the south and southeast of the area of this report where it includes beds equivalent to the Bangor limestone, Hartselle sandstone, and the Gasper formation to form a homogeneous shale body that extends from the base of the Ste. Genevieve—or possibly from the top of the Warsaw[13]—to the base of the Parkwood formation.

In the northern part of the mapped area the Floyd shale is a thin-bedded friable noncalcareous shale, ranging through gray, light-brown and olive-drab in color. The basal part is

[13]Butts, Charles, op. cit., p. 204.

generally concealed beneath the alluvium of Shoal Creek. The upper part is exposed along the northwest side of Shoal Creek Mountain where it consists predominantly of brown-weathering friable claystone with minor interbedded siltstone. The top 25 feet of the formation is siltstone with several thin ferruginous beds. In the valley three miles south of Odenville, fissile black shale occurs near the middle of the formation.

The estimated thickness of the Floyd shale in the northern part of the mapped area, near Parker Mill and McGrory Gap, is 700 feet. The southward thickening of the shale described above is indicated by a thickness of 1,200 feet recorded in the southern part of the Coosa coal field.[14]

Parkwood formation

The Parkwood formation was traced from its mapped outcrop in the vicinity of Birmingham to exposures in the southeast side of Shoal Creek valley. In this area it lies conformably on the Floyd shale and is overlain by the Pottsville formation of Pennsylvanian age. The base of the Parkwood formation was placed at the base of a persistent sandstone unit that constitutes the lower third of the formation. Its top was placed at the base of the conglomeratic sandstone known as the Shades sandstone member of the Pottsville formation. This interpretation conforms as closely as possible with mapping in the Bessemer-Vandiver quadrangles where the top of the Parkwood formation is placed at the bottom of the Brock coal, which occurs a short distance below the Shades sandstone member in the Cahaba valley.[15] The Brock coal is not present in the mapped area and no persistent lithologic unit that might represent it was found.

Two mappable units comprise the Parkwood formation—the basal sandstone, and an upper shale. The sandstone is light brown where weathered, but is white on fresh surfaces. It is composed of fine-grained clear or frosted quartz grains that are regularly laminated and only moderately well cemented. They form uniform beds that range in thickness from a few

[14]Butts, Charles, U. S. Geol. Survey Geol. Atlas, Bessemer-Vandiver folio, (no. 221), p. 12, 1927.

[15]Butts, Charles, op. cit., fig. 4, p. 11.

inches to two feet. The sandstone thickens to the southwest from 130 feet at Nichols Gap in sec. 33, T. 14 S., R. 4 E., to approximately twice that amount in Thompson Gap, Oak Mountain, 10 miles southwest of the mapped area.

The upper part of the Parkwood formation is composed chiefly of brown-weathering friable gray or greenish-gray shaly siltstone and claystone. About 20 feet below the top of the formation at Nichols Gap, however, a black thick-bedded tough noncalcareous claystone containing many tiny flakes of gypsum and scattered angular fragments of clear quartz, is exposed. The thickness of the Parkwood formation in this vicinity is 465 feet.

The reasons for including the Parkwood formation in the Mississippian series are well presented by Butts,[16] who states that the formation underlies the Brock coal, which occurs at a horizon that is generally recognized in the Appalachian region as the base of the Pennsylvanian series. Furthermore, no plane within the formation has been recognized where the boundary between rocks containing fossils of Mississippian and those of Pennsylvanian age could be drawn. He interprets the formation as representing the transition from Mississippian to Pennsylvanian deposition and concludes that it is the time equivalent of the hiatus that occurs between rocks of these series elsewhere in the Appalachian region.

The Paleozoic sea had almost disappeared from northern Alabama at the close of the Mississippian epoch, being reduced to a narrow northeast-trending embayment occupying parts of what is now St. Clair, Shelby, Jefferson, and Bibb Counties.[17] The basal sandstone of the Parkwood formation probably represents the initial period of stabilization that followed this retreat when a low hinterland supplied fine-grained sand to a shallow sea. At the close of the Mississippian epoch the embayment was so nearly filled in this area that lagoons and stagnant ponds were formed in some places.

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[16]Butts, Charles, Geology of Alabama: Geol. Survey of Alabama Special Report 14, p. 206, 1926.

[17]Butts, Charles, op. cit., pl. 76-D.

Pennsylvanian series

The Parkwood embayment was extensively blanketed in Pennsylvanian time by deposits that are predominantly of the continental type. In the mapped area this change was inaugurated by deposition of pebbles and sand followed by a recurrent sequence of medium- to fine-grained sand, silt, and clay. At times the Pennsylvanian embayment was filled more rapidly than it sank and its estuaries and delta bays became land-locked. Swamps and lagoons were formed in which vegetable matter collected and later turned to coal. The record of Pennsylvanian sedimentation in the mapped area ends in Pottsville time soon after the burial of the peat bog that was to become the Hammond coal Younger Pennsylvanian sediments occur in the Cahaba coal field[15] that adjoins the Coosa trough on the west, and probably were deposited in the mapped area as well, but erosion has removed them.

Pottsville formation

The Pottsville formation rests without angular discordance on the Parkwood formation. The formation extends throughout the area from the ridges southeast of Shoal Creek to the Coal City fault southeast of the coal basins. The resistant members form ridges—most pronounced in the lower part of the formation—and the less competent beds form valleys in patterns that generally conform to the structure.

The Pottsville formation consists of sandstone, siltstone, claystone, a few conglomeratic sandstones, and more than a score of coal beds, several of which have been mined. Its total thickness is estimated to be 5,500 feet.

As elsewhere in the Appalachian coal fields, the Pottsville formation can be conveniently divided into coal-bearing sequences that contain marketable beds of coal and barren sequences that contain no significant coal beds. In the Coal City and Fairview basins the lower part of the formation is barren and the upper part contains the coal. (See pl. 1.) The boundary between the two is the Lower Chapman coal.

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[15]Butts, Charles, op. cit., fig. 4.

Non-coal-bearing rocks of the Pottsville formation.—The non-coal-bearing rocks of the Pottsville formation, about 3,500 feet thick, comprise its lower part. They consist chiefly of red- or brown-weathering lenticular sandstone, siltstone, and claystone, but also include two light-gray conglomeratic sandstones near the base, and several thin local coal beds.

The Shades sandstone member, named for Shades Mountain east of Birmingham, constitutes the base of the Pottsville formation in this area. It was correlated with the type locality by tracing the outcrop from the vicinity of Birmingham to the mapped area. It forms the crests of the first ridges southeast of Shoal Creek and occurs also in a small up-faulted block one mile north of Eden. (See pl. 1.) A characteristic of its outcrop is a light-gray surface with large white spots. (See pl. 13 A.) The bedding is thick and some of the strata are cross-laminated. It is composed chiefly of well sorted subangular and angular grains of clear quartz. Dark grains are sparsely scattered through the rock. Irregular grains, interstitial fillings, and shreds of kaolinitic material are plentiful and suggest that the rock was originally arkosic. Thin segments of the base of the sandstone are locally impregnated with iron oxide. In places

PLATE 13 A. Shades sandstone member of the Pottsville formation on Shoal Creek Mountain, showing its characteristic weathered surface of light gray spotted with white.

the lower part of the sandstone contains lenses of conglomerate consisting of small rounded pebbles of milky quartz and minor quantities of angular fragments of shale and chert. The quartz pebbles also occur irregularly through the rest of the member as small lenses, single layers, and isolated individuals. Only the ferruginous parts of the sandstone are well cemented. The remainder shatters to sand when struck with a hammer. The Shades sandstone is 190 feet thick at Nichols Gap. It is overlain by shale and thin ferruginous sandstone from 200 to 300 feet thick, which contains an 8-inch coal bed near the base in the western part of the area. This coal bed is in the same stratigraphic position as the Cunningham coal in the southwestern end of the Coosa coal field and may be its equivalent.

The Pine sandstone member of the Pottsville formation overlies the shale and ferruginous sandstone, and is correlated with the Boyles sandstone member of the Pottsville in the Warrior coal field northwest of Birmingham.[19] It forms the second row of ridges southeast of Shoal Creek, and the rim of the Ragland basin northeast of Fairview. It is found also in the prominent hills a mile northwest of Eden. (See pl. 1.) The Pine sandstone member is more conglomeratic than the Shades sandstone member, but otherwise the lithology of the two is very similar. The thickness of the Pine sandstone member ranges from 210 to 250 feet.

Coaly beds were found at three horizons between the Pine sandstone member and the Lower Chapman coal. The oldest, which may correlate with the Nivens coal of the southwest end of the Coosa coal field, is 140 feet above the Pine sandstone member and consists of two coaly claystone beds each 4 inches thick, separated by claystone 4 inches thick. A younger coal bed, 450 feet stratigraphically above the Pine sandstone member, was worked for domestic use at the Day prospect in sec. 2, T. 15, S., R. 4 E. on Mount Castle Creek and at the Milam prospects in sec. 13, T. 15 S., R. 3 E. in Gulf Hollow. N. M. Day stated that the thickness of the bed at the former locality is 12 inches and William Milam was reported to have described his prospect as being "too thin to work." The bed outcrops in the road in the NW¼ sec. 4, T. 15 S., R. 4 E. where

[19]Butts, Charles, U. S. Geol. Survey Geol. Atlas, Bessemer-Vandiver folio (no. 221), p. 14, 1927.

it is from 3 to 6 inches thick. Another coal bed, about 2 inches thick, crops out on the Pell City-Ashville highway in sec. 25, T. 15 S., R. 3 E. at a horizon 1,050 feet below the Lower Chapman coal bed. The thickness of the barren Pottsville rocks above the Pine sandstone member could not be accurately determined because they are lenticular, poorly exposed, and their dip, modified along faults and folds, is variable. An estimate, based on dips and widths of outcrops, however, indicates that these rocks are about 2,800 feet thick.

Coal-bearing rocks of the Pottsville formation.—All of the Pottsville formation above the Lower Chapman coal bed is coal-bearing in this area. This sequence of rocks, which is approximately 2,000 feet thick, crops out in a belt 12½ miles long and 1½ to 2 miles wide that corresponds to the bottoms of the Coal City and Fairview basins. (See pl. 1.) The rocks consist chiefly of fine- to medium-grained sandstone, carbonaceous claystone, and siltstone, all of which are generally gray and lenticular. Beds of bituminous coal, which are described in the section of this report dealing with Economic Geology, are interbedded with these rocks..

The sandstone beds are medium- to thin-bedded and many grade both laterally and vertically into the adjoining strata. Cross-lamination is a common characteristic. The constituent grains, consisting of well sorted subangular clear quartz, generally are weakly cemented with silica and clay. Tiny flakes of muscovite are common in the younger sandstones, and grains of dark minerals are scattered throughout. Thin lenticular breccias consisting of chips and larger rounded fragments of claystone and ferruginous (ironstone) concretions occur near the base of some of the sandstone beds. (See pl. 14.) Solid fragments of carbonized plants and crushed or sand-filled stems of *Sigillaria* sp., *Calamites* sp., *Lepidodendron* sp., and other plants are common in many of the sandstone beds and most plentiful in those above the Fairview coal bed. Many of the sandstone beds weather to brick red or brown due to the presence of iron oxide leached from nearby shales. In some of the sandstone iron oxide, concentrated along joints, has formed harder layers that weather into boxwork or spheroidal patterns.

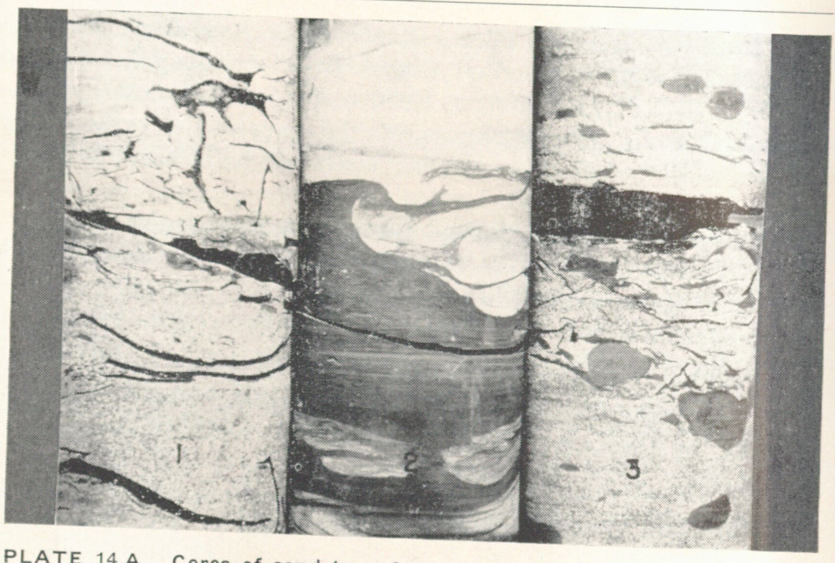


PLATE 14 A. Cores of sandstone from drill hole no. 4 showing: (1) included carbonized plant fragments, depth 1,059 feet; (2) roll of sand included in shale owing to subaqueous slumping before consolidation, depth 1,019 feet; and (3) pellets and chips of clay in sandstone, depth 1,037 feet.

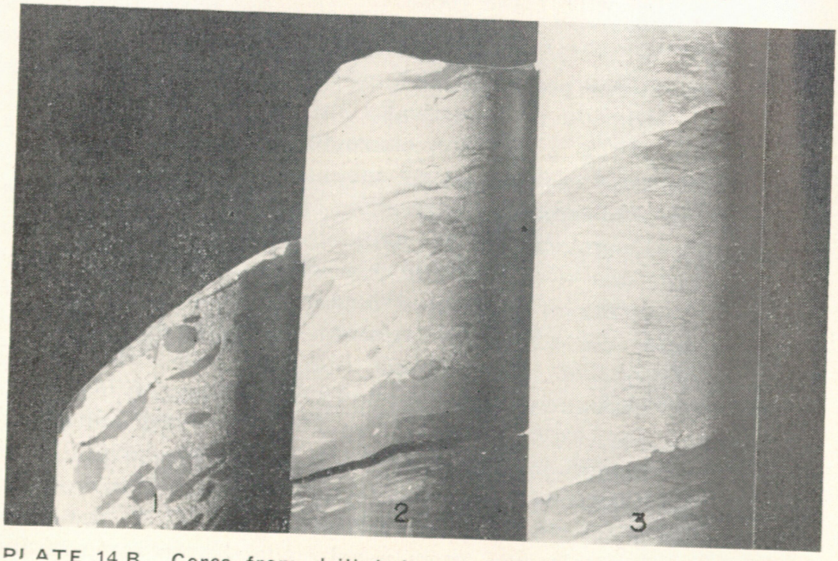


PLATE 14 B. Cores from drill hole no. 6 showing strata dipping 20° and: (1) ironstone and claystone conglomerate, depth 200 feet; (2) contact of sandstone over siltstone with reworked material between, depth 368 feet; and (3) cyclic deposition in siltstone, depth 118 feet.

PLATE 15 A. Joint patterns in Pottsville sandstone accentuated by a concentration of iron oxide in the walls of the joints.

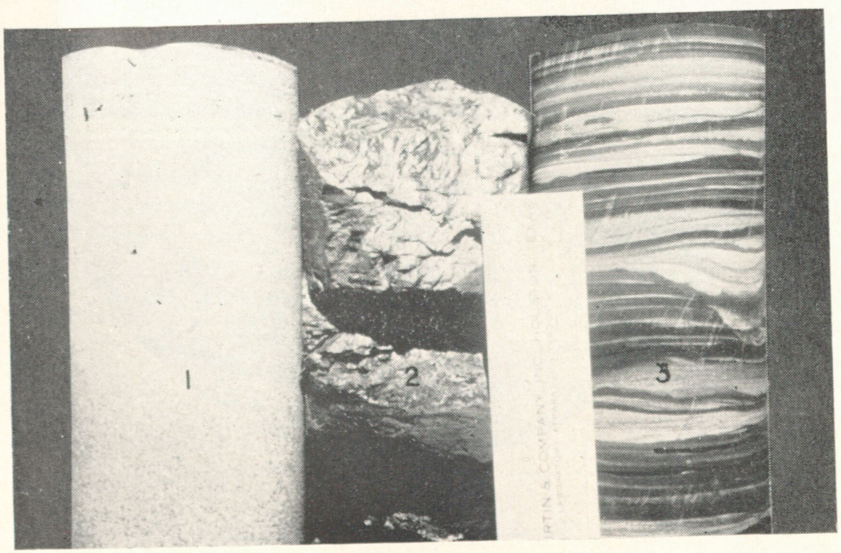


PLATE 16 A. Cores from drill hole no. 4 showing: (1) sandstone, depth 495 feet; (2) carbonaceous slickensided claystone, depth 457 feet; and (3) thin-bedded lenticular siltstone and sandstone, depth 419 feet.

The claystone beds are gray to black on fresh surfaces but weather brown or reddish brown. They are generally gradational with the siltstone. The structure is shaly, massive, or, in current or wave-marked material, finely lenticular. See pl. 16 A.) Ferruginous lenses and concretions characterize some of the black shale zones, particularly those above the Gann

Figure 3. Composite log of core drill holes.

coal bed. (See Composite log of core drill holes, fig. 3.) Carbonates are absent except in the form of ankerite (calcium-magnesium-iron carbonate) nodules that occur regularly through the coal-bearing sequence, and ankerite spherules that are persistent in the claystone between the Brown and Bibby coal

PLATE 17. Fossil fern, "Mariopteris pottsvillea" White, recovered from a core at a depth of 470 feet in diamond drill hole no. 22 in sec. 17, T. 15 S., R. 4 E.

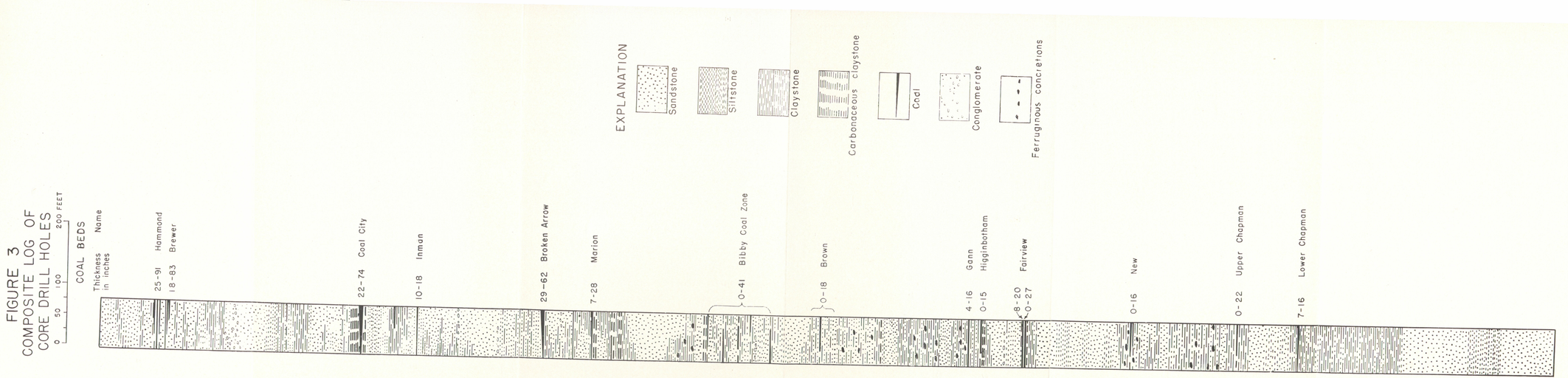
plete consolidation, depth 208 feet; (2) undisturbed cycles, depth 612 feet; and (3) slight distortion at the boundaries of the cycles due to small preconsolidation movement, depth 712 feet.

al bed. (See Composite log of core drill holes, fig. 3.) Car-
nates are absent except in the form of ankerite (calcium-
agnesium-iron carbonate) nodules that occur regularly through
e coal-bearing sequence, and ankerite spherules that are per-
tent in the claystone between the Brown and Bibby coal

1 inch

7. Fossil fern, "Mariopteris pottsvillea" White, recovered from a core at a depth of 470 feet in diamond drill hole no. 22 in sec. 17, T. 15 S., R. 4 E.

Figure 3. Composite log of core drill holes.



sition. (1) thin cycles cracked and reabsorbed during com-
plete consolidation, depth 208 feet; (2) undisturbed cycles,
depth 612 feet; and (3) slight distortion at the boundaries

beds. (See pl. 3.) The color of the fresh claystone is due to finely divided carbonaceous material and to segments of reeds, rushes, swamp grass, and ferns. Pl. 17.)

The siltstone beds are light or dark gray depending on the amount of carbonaceous material in them. Mica is a common constituent and ferruginous concretions occur in some of the finer-grained beds. The siltstone between the Gann and Higginbotham coal beds generally displays cyclic deposition, (see pl. 16 B.), a feature that also occurs in some places between the Bibby and Brown coal beds, and less frequently elsewhere in the stratigraphic section.

A sandstone bed, containing scattered quartz pebbles and lying near the top of the sequence of coal-bearing rocks, is significant because it is a possible correlative of the Straven conglomerate member of the Pottsvilse. The sandstone, about 150 feet thick, is similar to the Pine sandstone member but is more shaly and less conglomeratic. The pebbles occur most frequently

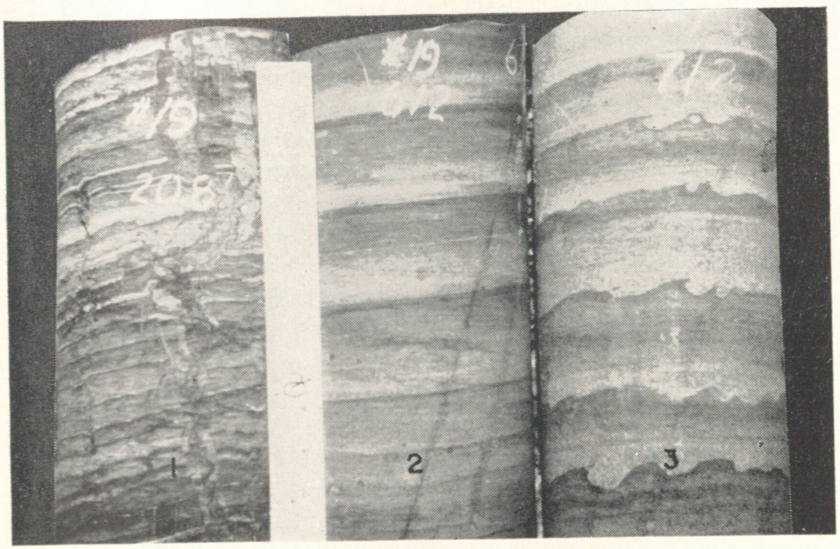


PLATE 16 B. Siltsone cores from drill hole no. 19 showing cyclic deposition: (1) thin cycles cracked and resolidified before complete consolidation, depth 208 feet; (2) undisturbed cycles, depth 612 feet; and (3) slight distortion at the boundaries of the cycles due to small preconsolidation movement, depth 712 feet.

at a horizon about 200 feet stratigraphically above the Coal City bed and about 4,550 feet above the Pine sandstone member. (See columnar section, fig. 2.)

Some improper use is made of white pebbles from the conglomerate as a "marker" for the underlying Coal City bed. This arises from the fact that in some places white pebbles from the disintegrated conglomerate are conspicuous in the soil a few feet above the coal. This relationship, which some prospectors thought was characteristic, is valid only where the pebbles have been transported a considerable distance. As the distance between the loose pebbles and the coal bed depends upon the amount of erosion that has taken place, it is not constant and hence is not a reliable criterion. Confidence can be placed, however, in the stratigraphic interval of about 200 feet between the conglomeratic sandstone in place and the Coal City bed.

Jones,[20] following previous writers, has called this conglomerate the "Fourth" or "Upper" conglomerate. As these names are applicable only to the northeast part of the Coosa coal field, they are not entirely satisfactory. The writer, however, has not suggested a more suitable name because the conglomerate is so poorly exposed in the mapped area that the outcrop is not adequate as a type locality, and because he believes that detailed mapping northeast into the Ragland basin and southwest to the Cahaba basin will show that this conglomerate may be correlated with the Straven conglomerate unit and so should bear that name.

Conditions of deposition of the Pottsville formation.—The Pottsville formation in the mapped area was deposited along the margin of the Pennsylvanian sea and represents a late stage in the filling of the Appalachian geosyncline in this area. The extensive uniform pebble-bearing ripple-marked sandstones at its base suggest the presence of shallow water in which sand and gravel from nearby rivers were distributed. Thereafter, sand and mud were deposited irregularly as bars and deltas were formed, and as velocities and courses of the rivers changed. Tidal flats were sometimes formed and yielded mud chips, which were included in the later sediments. As aggradation continued, lagoons, delta lakes, and brackish-water swamps devel-

[20]Jones, Walter B., op. cit., p. 10.

oped. Some of these were small; others extended throughout most of the area. Some received little or no sediment but were filled with swamp vegetation and became peat bogs. Others were protected from the storms and currents of the Appalachian sea but received fine-grained sediments from turbid backwaters of flooded rivers. In such localities the sediments were deposited in cycles representing periods of high and low precipitation. (See pl. 16 B.) Each cycle is considered to begin with a flood stage that spread a thin layer of fine-grained sand or coarse-grained silt over the floors of these bodies of water. As the flood abated, finer-grained material was deposited. During low-water stage, which ended each normal cycle, carbonaceous matter or products of chemical reaction only were deposited. These depositional forms were repeated in various sequences, the order of which was not uniform throughout the area.

Age relation of subdivisions of the Pottsville formation.—The Pottsville formation in the Cahaba basin was tentatively subdivided into lower, middle, and upper parts by David White, who provisionally bounded the "middle Pottsville" by the Harkness coal bed at its base and the Yeshic coal bed at its top.[21] These boundaries were not definitely identified in the Fairview and Coal City basins, and, therefore, were not used in mapping. Comparison of the stratigraphic successions in the two areas together with a single item of paleobotanical evidence suggest that a tentative correlation of the boundary between the "middle" and "upper Pottsville" may be made. Beds immediately above the Brown coal are of "middle Pottsville" age as indicated by the presence there of the fossil fern *Mariopteris pottsvillea* White, which, according to Charles B. Read,[22] is diagnostic of that subdivision. It is suggested that the "middle Pottsville" be extended upward to the base of the "Fourth" or "Upper" conglomerate, which represents the first marked change in deposition since early Pottsville time. Although this change appears to be of diastemic proportions in the vicinity of Wattsville, it may be correlated with a much more pronounced change in the Cahaba basin where the Straven conglomerate is the basal bed of a conglomeratic sandstone sequence 2,000 feet thick.[23]

[21]Butts, Charles, Geology of Alabama: Geol. Survey of Alabama Special Report no. 14, p. 215, 1926.

[22]Oral communication by Charles B. Read who identified the specimen.

[23]Butts, Charles, U. S. Geol. Survey Geol. Atlas, Bessemer-Vandiver folio (no. 221), p. 14, 1927.

The Straven conglomerate lies immediately above the Thompson coal bed, which Butts includes with "middle Pottsville" strata.[24] Beds of "upper Pottsville" age occur a short distance above the Straven conglomerate member of the Pottsville. Following identifications of fossil plants by David White, Butts suggests that the boundary be placed at either the Helena or Yeshic coal beds,[25] which lie 160 and 325 feet, respectively, above the conglomerate in the Cahaba field.[26] The hiatus represented by the deposition of the thick sequence of conglomeratic sandstone on fine-grained sediments is such as might be produced by orogenic deformation, and thus is a more satisfactory boundary than one based merely on younger beds containing flora that had adapted itself to the ensuing environment.

Erosion of Pottsville sediments between the Cahaba and Coosa basins makes it impossible to connect the outcrops of the "Fourth" or "Upper" conglomerate and the Straven conglomerate unit. As they occur in approximately equivalent parts of the stratigraphic section, however, they appear to be contemporaneous. It is suggested, therefore, that the boundary between the "middle" and "upper Pottsville" rocks in the northeastern part of the Coosa basin be placed provisionally at the base of the "Fourth" or "Upper" conglomerate, which in this area is about 200 feet above the Coal City coal bed and 140 feet below the Hammond coal bed.

Quaternary system

Quaternary deposits consist of unconsolidated valley fill and flood plain alluvium of Recent age. They occur in the bottoms of some of the streams and rest directly on the Pottsville formation and older rocks.

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[24]Butts, Charles, Geology of Alabama. Geol. Survey of Alabama Special Report no. 14, fig. 4, p. 210, 1926.

[25]Butts, Charles, U. S. Geol. Survey Geol. Atlas, Bessemer-Vandiver folio (no. 221), p. 15, 1927.

[26]Butts, Charles, U. S. Geol. Survey Geol. Atlas, Montevallo-Columbiana folio (no. 226), p. 15, 1940.

STRUCTURE

Coosa Trough

The Coosa coal field lies in the bottom of the Coosa trough, a composite synclinal structure along the southeast margin of the Appalachian mountains. The trough extends northeast from southern Shelby County for about 70 miles through St. Clair County and into Calhoun and Etowah Counties. Its southern end consists of two parallel synclines separated by closely folded and faulted rocks. The southeastern syncline contains the Yellow Leaf basin, and the northwestern syncline contains the Cunningham and Howard basins. Northeast of the Howard basin the syncline widens and overlaps the Yellow Leaf basin. Parts of it are known as the Black Ankle, Coal City, Fairview, and Ragland basins. As the Black Ankle area is not a readily distinguishable unit, it is considered to be a part of the Coal City basin in this report.

The Coosa trough in the vicinity of these basins is a cigar-shaped syncline that trends N. 45° E. Its northwest limb dips from 25° to 15°; its flat bottom is from one-quarter to one-half mile wide; and its southeast limb is deeply truncated by longitudinal high-angle thrust faults—the principal faults in the area. Other modifying structures are subsidiary longitudinal folds and faults in the northwest limb of the trough, bedding plane faults, and transverse faults near the bottom of the trough. (See pl. 1.)

Quantitative data regarding these faults are meagre because fault planes or fault zones are seldom exposed. Indirect evidence of faulting is confined chiefly to discordance in dip, repetition or absence of beds, and significant topographic forms.

Principal longitudinal faults.—This group includes three faults, which for the purpose of this report are called the Fairview, Coal City, and Black Ankle faults. The Coal City fault, the largest of the three, extends northeast beyond the mapped area into the Ragland area and southwest into the Vandiver anticline between the Yellow Leaf and Howard basins. The Fairview and the Black Ankle faults lie northwest of the Coal City fault and appear to branch from it, the former ex-

tending northeast from Broken Arrow and the latter trending southwest from a point two miles north of Eden.

All of these faults are high-angle reverse shears that have produced zones of extensive deformation from a few tens of feet to 500 or 600 feet wide in which nearly vertical and overturned strata dip from 90° to 60° on either side of the strike. The displacement is greatest along the Coal City fault. The direction and amount of the net slip along the faults was not determiend, but the disparity in age of the strata on either side of the faults suggests that the maximum displacement on these faults is in the direction of the dip of the fault plane.

Subsidiary longitudinal structures.—The general southeast dip of the long limb of the Coosa trough is modified along the outcrops of the Shades and Pine sandstone members of the Pottsville by small northeast-plunging folds generally associated with short longitudinal faults. These structures are in *en echelon* arrangement and die out in the less competent strata above and below the massive sandstones. The trend of most of these structure is about N. 65° E., which makes an angle of about 20° with the axis of the trough. Two of the fault planes dip 35°, one dips 80°, and one 90°. The others were not exposed. Faulting has repeated the strata, making patterns that suggest large components of dip slip. These faults, like the principal longitudinal faults, are reverse shears, but, unlike the larger high angle faults, they dip at both high and low angles.

Bedding plane faults.—Bedding plane faults were observed in Elbow Gap, sec. 13, T. 16 S., R. 2 E., where differential movement developed by close folding of the competent beds composing the Shades sandstone member of the Pottsville, thrust one bed over another. Slickensides and striations resulting from this movement are shown in plate 15 B.

Transverse faults.—The transverse faults are limited to a zone that is about two miles wide and is bounded on the southeast by the Fairview and Coal City faults. Many of them appear to branch from the longitudinal faults, or at least to originate in the close folds along their northeast sides. Other transverse faults, however, could not be traced to points closer than a quarter of a mile or more from the longitudinal faults. This relationship was reported to occur in some of the mines

PLATE 15 B. Slickensides and striations on a bedding plane of the Shades sandstone member of the Pottsville formation in Elbow Gap, formed by a thrust parallel with the bedding that resulted from close folding of the strata.

PLATE 18 A. Part of the disturbed zone of a transverse fault exposed in the NW corner NE¼NW¼ sec. 1, T. 16 S., R. 3 E.

along Coal Branch. It is well illustrated by the workings in the Coal City bed in the NW¼ sec. 12, T. 16 S., R. 3 E., shown on plate 9, where the lowest entries and rooms from either the Coal Branch mine (locality 13) or the Klondike mine (locality 12) extend northward toward the Vulcan No. 2 mine (locality 11) after passing around the southern end of the transverse faults that intervene between their portals.

Most of the transverse faults trend north-northwest making an angle of about 55° with the average strike of the longitudinal faults. None of them could be traced northwestward much beyond the outcrop of the Lower Chapman coal. Although they cross the axes of the basins, they are independent of the local attitudes of the strata, ranging from dip faults to strike faults as they cut arcuate beds. Eight reliable exposures of these faults were seen. In these exposures the widths of the disturbed zones range from a few feet to 60 feet (pl. 18 A.), and in two of the wider ones several planes of major movement were recognized. In two of the exposures the fault planes dip less than 30°, and in the remaining six they range from 90° to 60°. Most of the mines were flooded or so unsafe that they could not be explored, but miners reported that the faults underground generally dip at high angles and that the direction of dip is northeast in some places and southwest in others. A type of low angle thrust fault is illustrated in figure 4 (locality 4, pl. 10.)

Southwest of Wattsville where the transverse faults are most numerous, the outcrop pattern bulges sharply northwestward approximately half a mile. In the northeast half of the bulge the faults generally are downthrown to the northeast, and in the southwest half they are generally downthrown to the southwest, (See pl. 2, Coal outcrop map and section D-D′)—a pattern that would normally develop in a syncline with incompetent overburden that is flexed by lateral pressure. This vertical movement was supplemented by horizontal movement as shown by the nonalignment of the symbols representing the axes of the basins. (See plates 1 and 2.)

Classification of the transverse faults based upon the geometric position of the strata would place them in the category of oblique slip faults of normal, reverse, and rotational aspect.

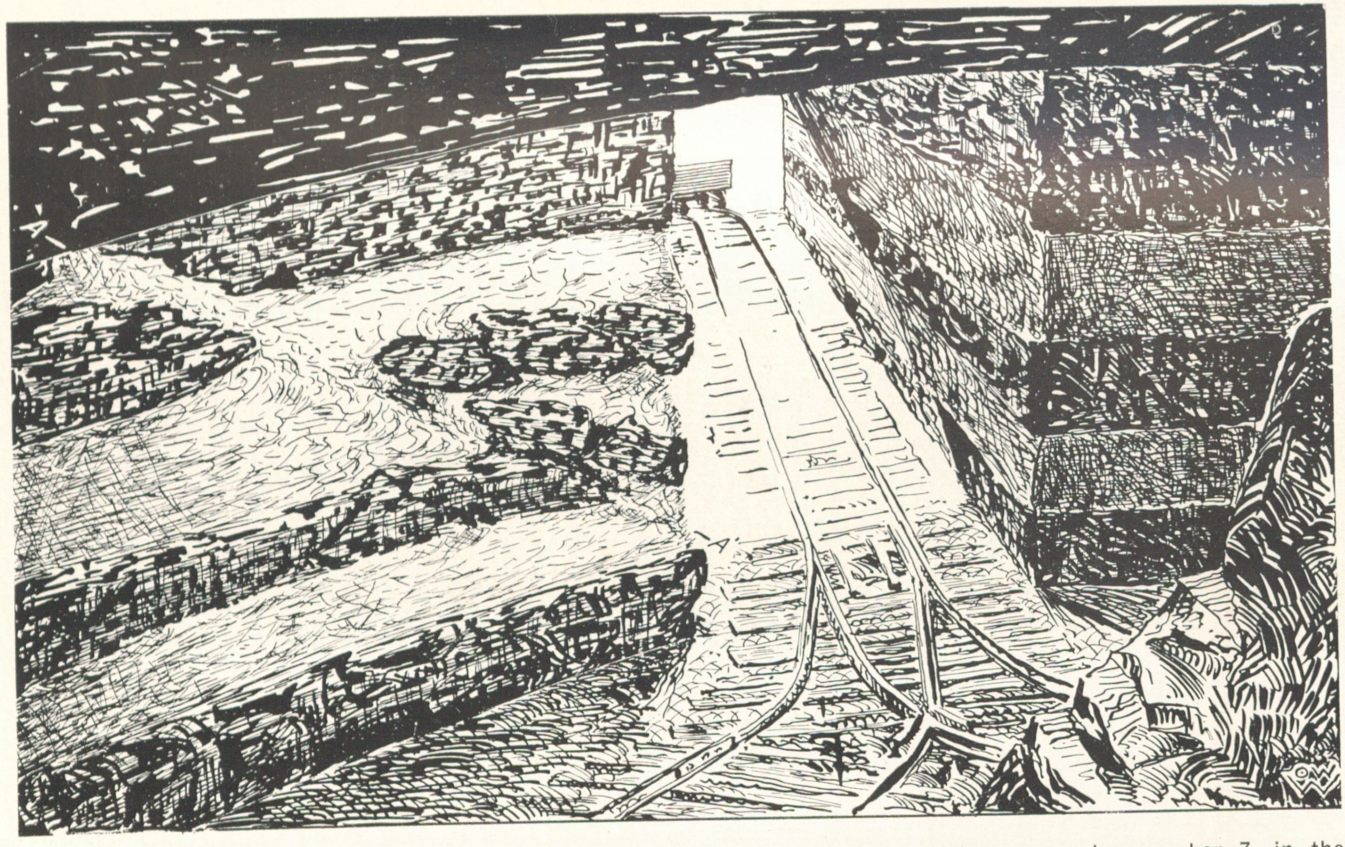

FIGURE 4. Low angle thrust fault in the first right entry in the Coosa Coal Company mine number 7, in the SW¼SE¼ sec. 1, T. 16 S., R. 3 E. (Locality 4, pl. 10.)

Genetically they are either thrust or tear faults, depending on whether the movement was preponderantly vertical or horizontal.

Sequence of diastrophic events.—The sequence of events that resulted in the formation of this part of the Coosa trough appears to have been initiated with pressure from the southeast that formed a broad trough and ruptured its southeast limb, forming the principal longitudinal faults. Continued pressure, applied from a more southerly direction, formed both the eastward-trending faulted folds one mile northwest of Eden and the subsidiary longitudinal structures in the northwest limb of the trough, and deepened the trough south of Wattsville. The transverse faults may have been initiated at this time. During a late stage of diastrophism, movement along the principal longitudinal faults continued and may have been sufficient to cause the segment southeast of the Coal City fault to override the Black Ankle-Fairview fault line in the vicinity of Broken Arrow. In any event, there was a sufficient amount of horizontal movement in this area to add a horizontal component to the displacement along the transverse faults. As a result of these movements some parts of the trough were more deeply depressed than others thereby forming the basins which in the mapped area are called the Fairview and Coal City basins.

Fairview basin.—The Fairview basin was first defined by Gibson[27] as the area extending from the settlement of Fairview, in sec. 10, T. 15 S., R. 4 E., southwest to a line that is marked approximately by the course of Soot Creek. The southeast boundary is the Fairview fault which cuts the southeast limb of the basin near its axial plane at Fairview and about three quarters of a mile southeast of the axial plane near Soot Creek. This fault is the boundary between the Fairview basin and the Ragland basin southeast of it. The northwestern and northern limits of the basin are considered by the author to be the base of the ridges formed by the Pine sandstone member of the Pottsville formation in Rock Pine and Shoal Creek Mountains. (See pl. 1.)

The Fairview basin is an elongate broad-bottomed simple structure, the axis of which is approximately horizontal. For

[27]Gibson, A. M., Report upon the Coosa coal field: Geol. Survey of Alabama Special Report 7, p. 53, 1835.

a distance generally not exceeding 300 feet northwest of the Fairview fault the rocks are closely folded and in places overturned. Northwest of this zone small folds occur in secs. 28 and 32, T. 15 S., R. 4 E. and sec. 6, T. 16 S., R. 4 E., but they merge with the flat bottom of the basin within a short distance. The dip of the northwestern limb of the basin is generally about 15°, but near most faults it is higher. Several transverse faults, most of which are short and of small displacement, cut the rocks near the bottom of the basin.

Coal City basin.—As defined by the writer, the Coal City basin, also called the Broken Arrow basin,[28] extends 9 miles southwest from Soot Creek, and includes Gibsons' Black Ankle area of indefinite boundaries[29] but excludes most of the area indicated as the Black Ankle basin on Prouty's map. The structural boundaries of this basin are as follows: on the northeast, the transverse fault about 1,000 feet northeast of drill hole no. 19 and the projection of this fault up Soot Creek; on the southeast, the Coal City and Black Ankle faults; on the southwest, a structural saddle in the vicinity of Cooks Springs; and on the northwest, the southeast base of the ridges formed by the Pine sandstone member, which is approximately equivalent to the outcrop of the top of that member.

The Coal City basin was probably similar to the Fairview basin in its early stages of formation, but it was modified by later stresses. From the transverse fault along its northeast boundary the structure descends by a series of southwest-tilted fault blocks to small oval area in the NE¼ sec. 12, T. 16 S., R. 3 E., the deepest part of the basin, where the strata are approximately 800 feet below corresponding beds in the bottom of the Fairview basin. (See pl. 2, Structure map and section D-D′.) In the northeast end of the basin the beds dip more steeply than in other parts, and are cut by at least 12 transverse faults that are generally longer, more closely spaced, and of greater displacement than those in the Fairview basin. Between this low area and Cooks Springs the Coal City basin is a gently rising trough, transversely faulted in places and containing a shallow depression where it crosses Wolf Creek. (See pl. 2.)

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[28]Gibson, A. M., op. cit., p. 53.

[29]Idem., p. 87.

ECONOMIC GEOLOGY

Coal Beds

The coal beds in the Fairview and Coal City basins differ considerably in extent, thickness, number of component parts, and quality. Some beds, such as the Gann and the upper "ledge" of the Fairview coal bed, are continuous throughout their areas of outcrop. Others, such as the Bibby coal bed, are notably discontinuous. The maximum range in thickness is illustrated by the Hammond coal bed, which ranges from 91 to 24 inches, and the minimum is shown by the Gann coal bed, which in most places range from 10 to 16 inches. Many of the beds are composed of alternating layers of coal and claystone or other kinds of waste and are said to be composite. The thickest beds in the area are of this type. A few of the beds consist of a single layer of coal, but these are generally the thinner beds. The quality of the coal is discussed in a later section of this report.

Fourteen beds have been prospected and named in the area. From the oldest to the youngest they are: Lower Chapman, Upper Chapman, New, Fairview, Higginbotham, Gann, Brown, Bibby, Marion, Broken Arrow, Inman, Coal City, Brewer, and Hammond coal beds. (See fig. 3, composite section.) Most of these have yielded coal for local domestic use; but the following six, named in the approximate order of their past importance, have been mined for industrial uses as well: Coal City, Broken Aorrow, Marion, Inman, Hammond, and Fairview coal beds.

The coal beds generally slope toward the centers of the basins with dips ranging between 10° and 20°. As a result of the synclinal structure and consequent erosion, the oldest coal bed underlies the greatest area, and younger coal beds underlie successively smaller areas centering over the deepest part of each basin. On the southeast sides of the basins, however, the arrangement is more complex because of the overturned beds and subsidiary folds.

The areal extent of these beds is shown on the outcrop map, plate 2, and their thicknesses and relationships underground

are indicated on the cross section, plate 3. Details of extent and thickness of the more important beds are given in plan on plates 4 to 10.

Lower Chapman coal.—The Lower Chapman coal bed, named for H. C. Chapman who mined it for local use on his farm in the NE¼ sec. 10, T. 15 S., R. 4 E., is the oldest of the coals in the upper or coal-bearing part of the Pottsville formation. It is the most widely distributed of the coal beds, but its outcrops and occurrences are too scattered to determine its continuity. For example, it was not found in drill holes nos. 4 or 5 in secs. 14 and 15, respectively, T. 16 S., R. 3 E. The bed lies near the top of a thick, carbonaceous valley-making shale and below a persistent ridge-making sandstone from 20 to 50 feet thick. It is 450 feet stratigraphically below the Fairview coal—an easily identified bed throughout most of the area.

The Lower Chapman bed is thickest in the northeastern part of the Fairview basin as indicated by the following descriptions of occurrences shown on plate 2:

Thickness of the Lower Chapman coal bed in diamond drill holes

Drill hole no.	Location	Thickness in inches
9	NW¼ sec. 20, T. 15 S., R. 4 E.	7
10	SW¼ sec. 10, T. 15 S., R. 4 E.	10½

Thickness of the Lower Chapman coal bed and description of the workings along its outcrop.

Location	Description
Beside old road west of White Oak Creek in the SE¼ sec. 2, T. 15 S., R. 4 E.	Three caved and flooded prospect slopes. Coal bed was not exposed. Roof is sandy siltstone containing many carbonized fragments of plants.
In the bed of a small branch about 800 feet northeast of the Sydney Chapman house in the NE¼ sec. 10, T. 15 S., R. 4 E.	Pit dug by Sydney Chapman beside silt-filled trenches of small stripping operation carried on prior to 1930. Mr. Chapman reported that the coal is 16 inches thick.
In old road in the NW¼ sec. 36, T. 15 S., R. 3 E.	Coal bloom 9 inches thick.
In old road in the SW¼ sec. 36, T. 15 S., R. 3 E.	Coal bloom 8 inches thick.

Upper Chapman coal.—The Upper Chapman coal bed, also named for H. C. Chapman who mined it in the SE¼ sec. 9, T. 15 S., R. 4 E., was observed in scattered locations in both basins. It occurs 100 feet stratigraphically above the Lower Chapman coal close above the prominent ridge-making sandstone that overlies that bed.

In most places the Upper Chapman coal is a single bed of bright coal, averaging 15 inches in thickness, but in the southwestern end of the Fairview basin and in much of the southwest half of the Coal City basin it consists of two or more thin coal beds with interbedded claystone. In drill holes nos. 4 and 5 it is absent altogether. The bed is abruptly lenticular in places as on the Du Bois farm described in the following table as locality 2. The maximum thickness of 24 inches, including a 1-inch clayey parting, was recorded in drill hole no. 8. The thickness of the bed in the core drill holes and in sections along the outcrop is shown in the following tables and much of this information is shown graphically on plate 4.

Thickness of the Upper Chapman coal bed in diamond drill holes

Drill hole no.	Location	Thickness in inches
2	SE¼ sec. 11, T. 16 S., R. 3 E.	17
4	NW¼ sec. 14, T. 16 S., R. 3 E.	0
5	SE¼ sec. 15, T. 16 S., R. 3 E.	0
6	NE¼ sec. 30, T. 15 S., R. 4 E.	9
7	NW¼ sec. 31, T. 15 S., R. 4 E.	5
8	NE¼ sec. 31, T. 15 S., R. 4 E.	23
9	NW¼ sec. 20, T. 15 S., R. 4 E.	16
10	SW¼ sec. 10, T. 15 S., R. 4 E.	17

Sections of the Upper Chapman coal bed and descriptions of workings along its outcrop. (Continued)

Reference no. on plate 4.	Location	Description	Inches
1	North bank of road cut in the SW¼ sec. 10, T. 15 S., R. 4 E.	Coal dips 20°, S. 30° E.	
		Sandstone with streaks of coal	60+
		Silty clay	9
		Bright coal	20
		Coaly clay	2
		Claystone	36+

Sections of the Upper Chapman coal bed and description of workings along its outcrop.

Reference no. on plate 4.	Location	Description
2	South of road in creek bottom on Du Bois farm in the SE¼ sec. 9, T. 15 S., R. 4 E.	Silt-filled workings of small stripping operations by H. C. Chapman in the 1880's and small slope mine of later date. Reopened by T. T. Gann who reported the bed to be 22 inches thick. Two hundred feet west of these workings the bed is 6 inches thick where it crops out in the road.
3	Northwest of road in creek bottom in the NE¼ sec. 17, T. 15 S., R. 4 E.	Silt-filled strip mine worked by Z. Kitchens about 1860. Prouty reports the coal to be 22 inches thick.[30]
4	Northeast of Soot Creek in the NE¼ sec. 36, T. 15 S., R. 3 E.	Caved prospect in nearly horizontal strata. Inches Siltstone ..... 24+ Coal ..... 4 Coaly claystone ..... 4 Coal ..... 5 Coaly claystone ..... 2 Coal ..... 2½ Clay and coal ..... 3 Clay ..... 8+
5	NE¼ SE¼ sec. 36, T. 15 S., R. 3 E.	Caved slope of Jim Turner mine reported to be 300 feet long. Beds dip 17°, S. 5° E.
6	About 600 feet w. of Wattsville Post Office.	Inches Clay ..... 36+ Clayey coal ..... 3 Coal ..... 14 Claystone ..... 36+ Caved pit reported by Jim Turner to contain coal 13 inches thick.

[30]Prouty, Wm. F., Map of the Coosa coal field: Geol. Survey of Alabama, 1912.

Sections of the Upper Chapman coal bed and description of workings along its outcrop. (Continued)

Reference no. on plate 4.	Location	Description
7	NW¼ sec. 21, T. 16 S., R. 3 E.	Outcrop dips 20°, S. 25° E.
		Inches
		Siltstone ..... 48+
		Sandstone 24
		Coal and clay 4
		Coaly clay 14
		Clay 2
		Coal 1
		Clay 5
		Siltstone with coal streaks 8
		Clayey coal 3
		Sandstone ..... 6+
8	Near the center of the N½ sec. 28, T. 16 S., R. 3 E.	Caved slope with claystone roof. A. F. Bowman reported the coal to be about 30 inches thick.
9	In highway bank in the NE¼ sec. 27, T. 16 S., R. 3 E.	Outcrop dips 80°, S. 20° E.
		Feet
		Sandy siltstone 15
		Silstone and thin sandstone 100
		Sandstone 3
		Coal 1
		Siltstone 10
		Sandstone 85

New coal.—The New coal bed, 175 feet stratigraphically above the Upper Chapman bed, is separated from it by a valley-forming shale. The New coal is absent in the northeast end of the Fairview basin and in the southwest end of the Coal City basin. Between these limits it persists as a single bed, averaging 11 inches thick and ranging from 16 to 8 inches.

The bed was cored in six of the drill holes with the following results:

Thickness of the New coal bed in diamond drill holes.

Drill hole no.	Location	Thickness in inches
2	SE¼ sec. 11, T. 16 S., R. 3 E.	36*
3	NW¼ sec. 1, T. 16 S., R. 3 E.	8
4	NW¼ sec. 14, T. 16 S., R. 3 E.	10
6	NE¼ sec. 30, T. 15 S., R. 4 E.	12
8	NE¼ sec. 31, T. 15 S., R. 4 E.	11
9	NW¼ sec. 20, T. 15 S., R. 4 E.	16**

* Includes 16″ of waste

** Includes several clay partings.

Outcrops of the New coal bed described in the following sections were seen near Wattsville.

Outcrops of the New coal bed.

Location	Descriptions
West bank of highway cut near the center of sec. 36, T. 15 S., R. 3 E.	Outcrop dips 20°, S. 45° E. Feet Claystone ..... 25 Carbonaceous claystone ..... 2 Coal ..... 1 Carbonaceous claystone ..... 3 Siltstone ..... 12 Claystone 20
About 800 feet east from Wattsville Postoffice.	McClure prospect Inches Clay ..... 24+ Coal ..... 10 Clay ..... 6+

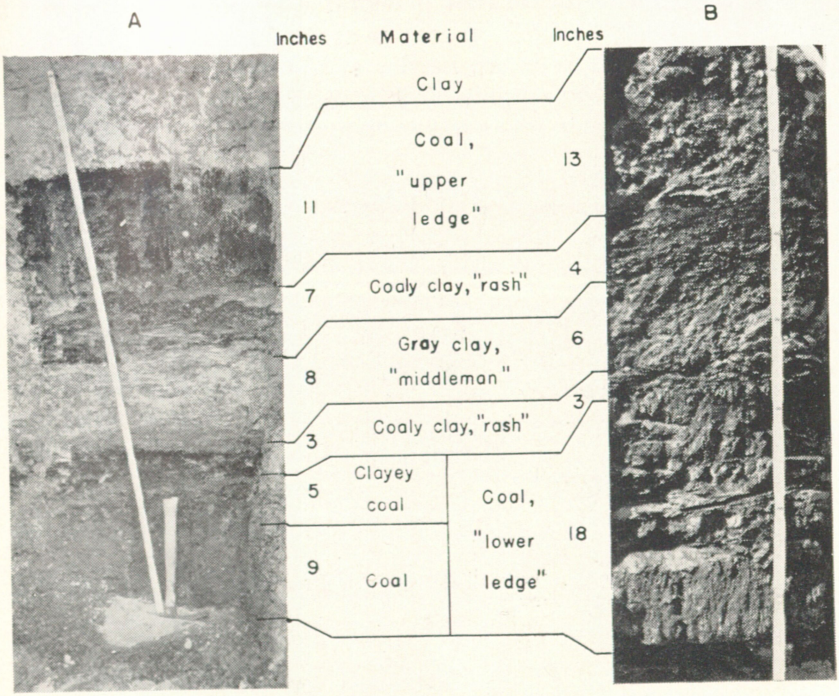

PLATE 19. Fairview coal bed at the outcrop, "A" and underground, "B" showing the parts that generally comprise the bed. "A" is at the Byce prospect, NW¼NE¼ sec. 2, T. 16 S., R. 3 E. (locality 19, pl. 5). "B" is from the Soot Creek mine, SE¼NE¼ sec. 36, T. 15 S., R. 3 E. (locality 13, pl. 5).

Fairview coal.—The Fairview coal is the thickest of the beds that occur extensively in both basins. It is 175 feet stratigraphically above the horizon of the New coal, near the top of a gray claystone bed that ranges from a few feet to 40 feet in thickness. The coal usually is found on the southeast side of narrow valleys formed by the erosion of the claystone from between two rather persistent ridge-making sandstones. In most places the coal is overlain by several feet of claystone, but in a few localities sandstone forms the roof.

Characteristically the Fairview bed consists of two layers of coal, called "ledges," separated by gray claystone, called the "middleman" by the miners. (See pls. 19 and 20.) Both "ledges" are commonly bordered by slickensided coaly claystone, called "rash," that in some places is so high in carbon as to be mistaken for coal. Tests of this material by the Bureau of Mines, however, indicate that it contains 50 percent or more of ash. The upper "ledge" of coal is continuous throughout both basins and commonly is the harder of the two layers. Its average thickness on the outcrop and in the drill holes, exclusive of "rash," is 13.8 inches. The lower "ledge" is continuous through-

PLATE 20 A. Fairview coal bed in pit in the NW¼NE¼ sec. 20, T. 15 S., R. 4 E. (locality 6, pl. 5), showing (1) claystone roof, (2) upper "ledge" of coal 16 inches thick, (3) clay "middleman" 5 inches thick, (4) clayey coal "rash" 3 inches thick, (5) lower "ledge" of coal 16 inches thick.

out the field except southwest of sec. 14, T. 16 S., R. 3 E. It is a single bed of coal in the northeastern end of the Fairview basin, but elsewhere clayey partings, ranging in thickness from a fraction of an inch to several inches, commonly occur in its upper part. The average thickness of the "ledge," exclusive of "rash," is 16.5 inches in the outcrop and 13.8 inches in the drill holes.

The "middleman" in the Fairview basin averages 6 inches in thickness. In the Coal City basin, however, it becomes thicker and reaches a maximum of 66 inches in drill hole no. 4. Beetween drill holes Nos. 4 and 5 the "middleman" merges with the underlying claystone because of the disappearance of the lower "ledge" of coal.

The thickness and sequence of the various layers that comprise the Fairview bed are recorded in detail in the well logs and in the following sections, and are shown graphically on plate 5.

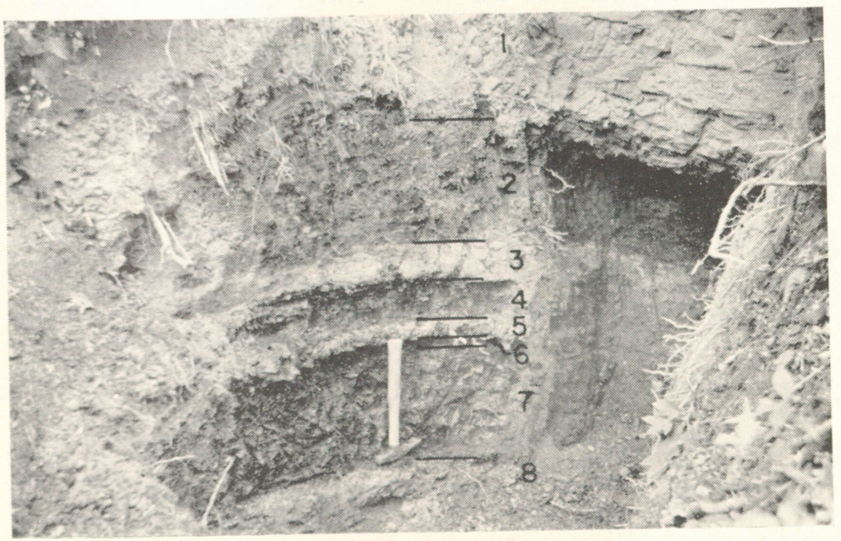

PLATE 20 B. Fairview coal bed in pit in the SW¼SW¼ sec. 30, T. 15 S., R. 4 E. (locality 11, pl. 5), showing (1) sandstone roof, (2) upper "ledge" of coal 11 inches thick, (3) clay "middleman" 4 inches thick, (4) upper split of the lower "ledge" of coal 5 inches thick, (5) clay parting 3 inches thick, (6) clayey coal "rash" 2 inches thick, (7) lower split of the lower "ledge" of coal 11 inches thick, (8) carbonaceous clay floor.

Sections along the outcrop of the Fairview coal bed.

Reference no. on plate 5.	Location	Description
1	NE¼SW¼ sec. 10, T. 15 S., R. 4 E.	Caved prospect slope. Coal dips 25°, S. 25° E.

	Inches
Claystone	48+
Weathered coal	14
Gray clay	2
Coal and clay	2
Weathered coal	12
Carbonaceous clay	3+

2	Northeast bank of branch in the SE¼ SE¼ sec. 9, T. 15 S., R. 4 E.	Caved slope of Brown mine. Coal dips 15°, S. 10° E.

	Inches
Claystone	36+
Coal	10
Clayey coal	1
Sheared coal	8
Gray clay	5
Clayey coal with disseminated pyrite	3
Coal	10
Carbonaceous clay	1
Gray clay	1+

3	NW¼NE¼ sec. 16, T. 15 S., R 4 E.	Pit on Williams farm. Coal dips 15°, S. 45° E.

	Inches
Sandstone	36+
Silty claystone	48
Carbonaceous claystone	21
Coal	1½
Clay	1
Bright coal	7
Sheared coal	15
Coaly claystone	3
Carbonaceous claystone	7
Coaly claystone	6
Sheared coal	10
Coaly claystone	5
Carbonaceous claystone	3+

4	Near the top of a ridge near the SW. corner NW¼ sec. 16, T. 15 S., R. 4 E.	Coal in pit dips 13°, S. 40° E.

	Inches
Sandstone	36+
Claystone	38
Coal	17

Sections along the outcrop of the Fairview coal bed. (Continued)

Reference no. on plate 5.	Location	Description	
		Gray clay	4
		Coal	18
		Gray clay	6+
5	SE¼SE¼ sec. 17, T. 15 S., R. 4 E.	Caved prospect slope.	Inches
		Coal	15
		Coaly clay	8
		Clay	8
		Coal	17
		Clay	1
		Coal	3
		Clay	3+
6	In gully on west side of road in the NW¼ NE¼ sec. 20, T. 15 S., R. 4 E.	Coal in pit dips 15° due east.	Inches
		Claystone	24+
		Coal	10
		Clayey coal	3
		Coal	3
		Gray clay	5
		Clayey coal (rash)	3
		Coal	16
		Clayey coal (rash)	3
		Carbonaceous clay	6+
7	SE¼NW¼ sec. 20, T. 15 S., R. 4 E.	Slope of Ethel mine. Coal dips 14°, S. 50° E.	Inches
		Sandstone	60+
		Claystone	66
		Coal	15
		Carbonaceous clay	3
		Coal	21
		Carbonaceous clay	2+
8	SW¼SW¼ sec. 20, T. 15 S., R. 4 E.	Coal in pit dips 17° southeast.	Inches
		Sandstone	60+
		Coal	12
		Clay	2
		Clayey coal (rash)	5
		Gray clay	2
		Coal	4
		Carbonaceous clay	2
		Coal and clay	5
		Coal	12

Sections along the outcrop of the Fairview coal bed. (Continued)

Reference no. on plate 5.	Location	Description
		Coal and clay 2
		Carbonaceous clay ..... 3+
9	NE¼NE¼ sec. 30, T. 15 S., R. 4 E.	Slope of Brown Jr. mine. Coal dips 12° - 17°, S. 45° E.
		Inches
		Sandstone ..... 60+
		Claystone 38
		Coal 11
		Coal and clay (rash) 4
		Gray clay 4
		Coal 4
		Clay 3
		Coal 13
		Coal and clay (rash) 2
		Gray clay ..... 6+
10	SW¼NE¼ sec. 30, T. 15 S., R. 4 E.	Coal in pit dips 30°, S. 20° E.
		Inches
		Sandstone ..... 24+
		Claystone 36
		Coal 10
		Coaly clay 3
		Gray clay 5
		Coal 5
		Carbonaceous clay 1
		Coal 14
		Gray clay ..... 2+
11	SW¼SW¼ sec. 30, T. 15 S., R. 4 E.	Coal in pit dips 15°, S. 50° E.
		Inches
		Sandstone ..... 36+
		Coal 11
		Clay 4
		Coal 5
		Carbonaceous clay 3
		Clayey coal (rash) 2
		Coal 11
		Carbonaceous clay ..... 2+
12	In bank east of road in the NW¼NW¼ sec. 31, T. 15 S., R. 4 E.	Coal in pit dips 17°, S. 45° E.
		Inches
		Clay ..... 36+
		Bright coal 14
		Clayey coal 3
		Coal and clay 4
		Clay 4
		Coal 6

Sections along the outcrop of the Fairview coal bed. (Continued)

Reference no. on plate 5.	Location	Description
		Coaly clay ..... 2 Coal ..... 9 Coal and clay ..... 2 Carbonaceous clay ..... 7+
13	Southeast of road near Soot Creek in the SE¼ NE¼ sec. 36, T. 15 S., R. 3 E.	Soot Creek (Brown) mine. The following description of the mine is from oral reports by T. Hammett, Dr. F. H. H. Calhoun, consultant for the Seaboard Air Line Railroad, and some of the men who worked in the mine. The mine slope is between 800 and 1,000 feet long with entries to right and left at intervals of 125 feet, beginning about 400 feet from the portal. Most of the entries are short but Mr. Hammett reported that one of the left entries is 400 feet long and the second right entry is about 1,000 feet long. Both entries found faults near their ends. The following section is the average of four measurements taken in the air vent about 50 feet from the surface. (See pl. 19, column B.) Coal dips 20° due south. Inches Claystone ..... 12+ Coal ..... 13 Coaly claystone (rash) ..... 4 Gray claystone ..... 6 Coaly claystone (rash) ..... 3 Coal with scattered lenses of bone ..... 18 Carbonaceous clay ..... 3+
14	Bank at road intersection in the NW¼SE¼ sec. 36, T. 15 S., R. 3 E.	Prospect on downthrown side of a transverse fault. Coal dips 40° due east. Inches Claystone ..... 36+ Coal ..... 14 Coaly clay ..... 2 Gray clay ..... 8 Coal 3

Sections along the outcrop of the Fairview coal bed. (Continued)

Reference no. on plate 5.	Location	Description	
		Clay and coal	3
		Coal	13
		Carbonaceous clay	3+
15	South side of railroad cut in the SW¼SE¼ sec. 36, T. 15 S., R. 3 E.	Outcrop dips 24°, S. 35° E.	
			Inches
		Clay	12+
		Coal	12
		Carbonaceous clay	2
		Coal	2
		Gray clay	4
		Clayey coal	5
		Carbonaceous clay	1
		Coal	13
		Gray clay	9
		Clay and coal	4
		Carbonaceous clay	12+
16	SW¼SE¼ sec. 36, T. 15 S., R. 3 E.	Slope of George Kitchens mine. Coal dips 30° due south.	
			Inches
		Sandstone	60+
		Siltstone	12
		Coal	1
		Clay	0½
		Coal	14
		Coaly clay	4
		Gray clay	7
		Coal	1
		Clay	1
		Coal	6
		Clay	1
		Coal	4
		Clay	0½
		Coal	11
		Clay	4+
17	SE¼SW¼ sec. 36, T. 15 S., R. 3 E.	Manning prospect. Coal dips 33°, S. 15° E.	
			Inches
		Sandstone	48+
		Clay	10
		Clay with streaks of coal	4
		Coal	13
		Claystone with several thin layers of coal	6
		Gray clay	8

Sections along the outcrop of the Fairview coal bed. (Continued)

Reference no. on plate 5.	Location	Description
		Carbonaceous claystone .... 3 Coal .... 5 Clay .... 1 Coal .... 12 Coaly claystone .... 2 Gray clay .... 7 Carbonaceous claystone .... 4+
18	In the road in the NE¼NE¼ sec. 2, T. 16 S., R. 3 E.	Inches Coal in pit dips 24°, S. 50° W. Claystone .... 24+ Coal .... 10 Clay with streaks of coal .... 5 Gray clay .... 12 Coaly claystone .... 5 Coal .... 5 Clay .... 0½ Coal .... 15 Coaly claystone .... 2 Carbonaceous claystone .... 2+
19	NW¼NE¼ sec. 2, T. 16 S., R. 3 E.	Byce prospect (see pl. 19 A). Coal dips 10°, S. 25° E. Inches Clay .... 24+ Coal .... 11 Clay and coal (rash) .... 7 Gray clay .... 8 Coaly clay (rash) .... 3 Clayey coal .... 5 Coal .... 9 Clay .... 2+
20	NE¼SW¼ sec. 2, T. 16 S., R. 3 E.	Coal in pit dips 22°, S. 10° W. Inches Claystone .... 72+ Coal .... 10 Clayey coal .... 3 Carbonaceous claystone .... 21 Clay and coal .... 5 Coal .... 4 Carbonaceous claystone .... 3 Coal .... 15 Carbonaceous claystone .... 3+

Sections along the outcrop of the Fairview coal bed. (Continued)

Reference no. on plate 5.	Location	Description
21	NE¼NW¼ sec. 11, T. 16 S., R. 3 E.	Coal in pit dips 22°, S. 75° E.
		Inches
		Claystone ..... 60+
		Coal 18
		Gray clay 8
		Carbonaceous clay 8
		Coal 26
		Carbonaceous clay ..... 4+
22	SE¼NW¼ sec. 11, T.	Coal in pit dips 20°, S. 45° E.
		Inches
		Claystone ..... 84+
		Coal 18
		Coaly claystone 2
		Gray clay 4
		Coaly claystone 2
		Carbonaceous claystone 40
		Coal 1
		Carbonaceous claystone 2
		Coal 2
		Carbonaceous claystone 2
		Coal 13
		Carbonaceous claystone ..... 2+
23	Road cut in the SE¼ SW¼ sec. 15, T. 16 S., R. 3 E.	Outcrop dips 10°, S. 45° E.
		Inches
		Sandstone and siltstone ..... 120+
		Coal 9
		Coaly claystone 17
		Sandy claystone 96
		Sandstone ..... 60+
24	NW. corner NW¼ sec. 28, T. 16 S., R. 3 E.	Caved prospect where A. F. Bowman reported coal 7 inches thick.
25	NW¼NE¼ sec. 28, T. 16 S., R. 3 E.	Caved slope 30 to 40 feet long, inclined 5°, N. 10° W., from which coal 14 inches thick was mined according to A. F. Bowman.
26	NE. corner SW¼NE¼ sec. 32, T. 15 S., R 4 E.	Overturned bed in pit dips 80°, S. 43° E.
		Inches
		Clay ..... 12+
		Clay and coal 2
		Coal 15
		Clay 2
		Coal 12
		Clayey coal 8
		Clay and coal 3
		Clay ..... 3+

Higginbotham coal.—The Higginbotham coal bed, 70 feet stratigraphically above the Fairview bed, generally crops out at the base of the slope formed on the sandstone that overlies the Fairview bed. It extends continuously throughout the coal bearing areas of both basins except at their outer extremities where it disappears with the thinning of the stratigraphic section. The bed commonly consists of a single layer of coal, but in places it contains lenses of clay. It is characterized by a light-gray underclay 6 to 8 inches thick, beneath which lies a carbonaceous coaly claystone from one to two feet thick. In the Fairview basin the Higginbotham coal has an average thickness of 12 inches and reaches a maximum thickness of 15 inches in drill hole no. 22 in sec. 15, T. 15 S., R. 4 E., and drill hole no. 2 in sec. 11, T. 16 S., R. 3 E. It thins southwestward to an average of 4 inches in the rest of the Coal City basin.

The thickness of the bed in the core drill holes and in sections along the outcrop (see pl. 2 is shown in the following tables:

Thickness of the Higginbotham coal bed in diamond drill holes

Drill hole no.	Location	Thickness in inches
1	SW¼ sec. 1, T. 16 S., R. 3 E.	0
2	SE¼ sec. 11, T. 16 S., R. 3 E.	15
3	NW¼ sec. 1, T. 16 S., R. 3 E.	0
4	NW¼ sec. 14, T. 16 S., R. 3 E.	0
5	SE¼ sec. 15, T. 16 S., R. 3 E.	0
6	NE¼ sec. 30, T. 15 S., R. 4 E.	13
7	NW¼ sec. 31, T. 15 S., R. 4 E.	9
8	NE¼ sec. 31, T. 15 S., R. 4 E.	8
9	NW¼ sec. 20, T. 15 S., R. 4 E.	9
11	SW¼ sec. 21, T. 15 S., R. 4 E.	14
12	NE¼ sec. 29, T. 15 S., R. 4 E.	15*
13	NW¼ sec. 16, T. 15 S., R. 4 E.	10
14	SW¼ sec. 29, T. 15 S., R. 4 E.	9
15	NW¼ sec. 21, T. 15 S., R. 4 E.	12
16	NW¼ sec. 13, T. 16 S., R. 3 E.	7
17	SE¼ sec. 1, T. 16 S., R. 3 E.	0
19	NW¼ sec. 6, T. 16 S., R. 4 E.	3
20	NE¼ sec. 6, T. 16 S., R. 4 E.	13
21	SE¼ sec. 16, T. 15 S., R. 4 E.	12
22	NW¼ sec. 15, T. 15 S., R. 4 E.	4½
23	NW¼ sec. 29, T. 15 S., R. 4 E.	6**
24	SW¼ sec. 16, T. 15 S., R. 4 E.	9

* Includes 3 inches of waste.

** Includes 1 inch of waste.

Sections along the outcrop of the Higginbotham coal bed

Location	Description	Inches
Road bank in the NE¼ sec. 20, T. 15 S., R. 4 E.	Claystone	24+
	Coal with clay lenses	6
	Clayey coal	10
	Carbonaceous clay	22
	Gray clay	4+
Near center sec. 20, T. 15 S., R. 4 E.	Coal in pit dips 18°, S. 40° E.	
	Siltstone	4+
	Coal	11
	Clay	8
	Carbonaceous clay	12
	Gray clay	8+

Gann coal.—The Gann coal bed occurs at the base of a valley-making carbonaceous shale that contains many ferruginous concretions. (See complete log, fig. 3.) The bed is about 20 feet stratigraphically above the Higginbotham coal except near Fairview where the Higginbotham coal bed either coalesces with it or pinches out. The Gann coal bed is absent in the southwestern end of the Coal City basin. It consists of a single layer of coal, the thickness of which averages 11 inches and reaches a maximum in the southwestern part of T. 15 S., R. 4 E., where 14 to 16 inches of clean coal was cored. The thickness of the bed in the drill holes and along the outcrop is shown on plate 6.

Brown coal.—The Brown coal is a discontinuous bed named for Watt T. Brown who was active in developing the coal of this area in the decade following 1910.[31] It generally occurs in a coaly zone on the southeast side of the valley in which the Gann and Higginbotham coal beds crop out. The stratigraphic interval between the Brown and Fairview beds generally is 340 feet but it ranges from 310 to 360 feet. The Brown coal bed is absent in the southwest end of the Coal City basin and in a small area south of Wattsville. Elsewhere, its thickness averages about 10 inches. Thickening of the bed in some places is due to interbedded clayey partings, which may constitute a large portion of the total. The range in thickness of the bed and its constituent parts at locations indicated on plate 2 is shown in the following tables:

[31]Jones, Walter B., Summary report of the Wattsville basin of the Coosa coal field: Geol. Survey of Alabama Circular 6, p. 7, 1929.

Thickness of the Brown coal bed in diamond drill holes

Drill hole no.	Location	Coal	Included waste	Total thickness of the bed
1	SW¼ sec. 1, T. 16 S., R. 3 E.	0	0	0
2	SE¼ sec. 11, T. 16 S., R. 3 E.	12	0	12
3	NW¼ sec. 1, T. 16 S., R. 3 E.	0	0	0
4	NW¼ sec. 14, T. 16 S., R. 3 E.	6	0	6
8	NE¼ sec. 31, T. 15 S., R. 4 E.	4	0	4
11	SW¼ sec. 21, T. 15 S., R. 4 E.	10	2	12
12	NE¼ sec. 29, T. 15 S., R. 4 E.	9	1	10
14	SW¼ sec. 29, T. 15 S., R. 4 E.	9	0	9
15	NW¼ sec. 21, T. 15 S., R. 4 E.	10½	8½	19
16	NW¼ sec. 13, T. 16 S., R. 3 E.	11	0	11
17	SE¼ sec. 1, T. 16 S., R. 3 E.	0	0	0
19	NW¼ sec. 6, T. 16 S., R. 4 E.	11	0	11
20	NE¼ sec. 6, T. 16 S., R. 4 E.	3	0	3
21	SE¼ sec. 16, T. 15 S., R. 4 E.	9½	5½	15
22	NW¼ sec. 15, T. 15 S., R. 4 E.	8	1	9
23	NW¼ sec. 29, T. 15 S., R. 4 E.	3	0	3
24	SW¼ sec. 16, T. 15 S., R. 4 E.	6	0	6

Sections along the outcrop of the Brown coal bed

Location

SE¼SE¼ sec. 10, T. 15 S., R. 4 E.

Description

Coal in prospect slope in creek bank dips 25°, S. 85° W.

	Inches
Silty clay	48+
Coal and clay	8
Coal	4
Clay	1
Coal	1½
Clay with streaks of coal	3
Clay	5+

Near the center of the W½, SE¼ sec. 10, T. 15 S., R. 4 E.

A bed of coal 6 inches thick was exposed above cavings in abandoned mine slope.

	Inches
Claystone and siltstone	84+
Coal	6
Claystone	36+

Road cut in the NW¼ sec. 29, T. 15 S., R. 4 E.

Highway cut in the NW¼NE¼ sec. 1, T. 16 S., R. 3 E.

	Feet	Inches
Sandstone	90	0
Claystone	5	6
Coal	---	4
Claystone with ferruginous concretions	10	6
Coal and clay	---	10
Coaly claystone	---	4
Shale	100+	---

Bibby zone of coal beds.—The Bibby zone of coal beds consists of from one to four beds of coal that occur at various positions within a stratigraphic range of about 100 feet. The lowest bed is about 420 feet stratigraphically above the Fairview coal. The beds were mined chiefly by stripping along Bibby Branch in secs. 14 and 22, T. 16 S., R. 3 E., where the beds of clean coal reach their maximum thickness. Near Fairview a single bed 3 inches thick represents the group, but to the southwest other generally thin beds are added in overlapping discontinuous patterns. Four beds have been recognized at the Bibby pits in the NW¼ sec. 14, T. 16 S., R. 3 E., and the thickest of the beds was prospected by stripping (see pl. 18 B) during 1945. The number of beds decreases to two in the subsidiary basin about a mile southwest of the Bibby pits. The thickness of the various beds of the Bibby zone in core drill holes and in sections along the outcrop (see pl. 2) are shown in the following tables:

PLATE 18 B. A prospect on one of the Bibby coal beds in the SW¼NW¼ sec. 14, T. 16 S., R. 3 E.

Thickness of Bibby coal beds in diamond drill holes

Drill hole no.	Location	Thickness in inches
1	SW¼ sec. 1, T. 16 S., R. 3 E.	10 and 20*
2	SE¼ sec. 11, T. 16 S., R. 3 E.	10, 16, 20**, and 9
3	NW¼ sec. 1, T. 16 S., R. 3 E.	12
4	NW¼ sec. 14, T. 16 S., R. 3 E.	8, 3, 13, and 16
8	NE¼ sec. 31, T. 15 S., R. 4 E.	3 and 4
11	SW¼ sec. 21, T. 15 S., R. 4 E.	10 and 4
12	NE¼ sec. 29, T. 15 S., R. 4 E.	8 and 3
14	SW¼ sec. 29, T. 15 S., R. 4 E.	7 and 3
15	NW¼ sec. 21, T. 15 S., R. 4 E.	11
16	NW¼ sec. 13, T. 16 S., R. 3 E.	4 and 18
17	SE¼ sec. 1, T. 16 S., R. 3 E.	10, 4, 7, and 14
19	NW¼ sec. 6, T. 16 S., R. 4 E.	10 and 10
20	NE¼ sec. 6, T. 16 S., R. 4 E.	9
21	SE¼ sec. 16, T. 15 S., R. 4 E.	12
22	NW¼ sec. 15, T. 15 S., R. 4 E.	3

* Includes 2 inches of bone coal.

** Includes 4 inches of waste.

Sections along the outcrop of the Bibby zone of coal beds

Location	Description	Inches
Road cut 500 feet W. of Pope Chapel, near S. quarter-corner, sec. 30, T. 15 S., R 4 E.	Outcrop dips 24°, S. 65° E.	
	Clay	60+
	Clayey coal	2
	Coal	10
	Clay	36+
Railroad cut in the NE¼NW¼ sec. 31, T. 15 S., R. 4 E.		Inches
	Gray clay	17+
	Coal	2
	Gray clay	3
	Coal	2
	Carbonaceous clay	2
	Gray clay	24+
NW. corner SE¼ sec. 6, T. 16 S., R. 4 E.	Coal in pit dips 35°, N. 85° W.	
	Siltstone	24+
	Sandstone	24
	Coal	11
	Clay	1
	Coal	1
	Clay with streaks of coal	4
	Coal	7½
	Fire clay	4

Sections along the outcrop of the Bibby zone of coal beds (Continued)

Location	Description
Cut in abandoned railroad grade in the NW¼NW¼ sec. 6, T. 16 S., R. 4 E.	Outcrop dips 20°, S. 25° W. Inches Silty claystone ..... 36+ Coaly clay ..... 1 Brown clay ..... 3 Coal ..... 2 Fire clay ..... 2 Carbonaceous clay ..... 2 Coal ..... 3 Fire clay ..... 1 Coal and clay ..... 5 Claystone ..... 12+
Highway cut in the SW. corner NW¼NE¼ sec. 1, T. 16 S., R. 3 E.	Outcrop dips 40°, S. 35° W. Inches Siltstone ..... 48+ Fire clay ..... 3 Clayey coal ..... 5 Light brown clay ..... 3 Carbonaceous clay ..... 1½ Coal ..... 1½ Carbonaceous clay ..... 5 Light brown clay ..... 12+
2,100 feet S. and 1,100 feet E. of the NW. corner sec. 14, T. 16 S., R. 3 E.	Coal in prospect slope 20 feet long dips 8°, S. 50° E. Inches Claystone ..... 36+ Coal ..... 5 Carbonaceous claystone ..... 2½ Coal ..... 3½ Carbonaceous claystone ..... 12 Coaly claystone ..... 3 Coal ..... 5 Coaly claystone ..... 8 Water
Beside logging road 2,500 feet S. and 700 feet E. of the NW. corner sec. 14, T. 16 S., R. 3 E.	Two pits aligned northward exposed the section shown below, but a larger pit a few feet west contains no coal, a condition that indicates the presence of a fault that is also exposed in the distorted strata in the northeast end of a nearby strip pit. (See pl. 18 B.) Inches Silty claystone ..... 24+ Coal ..... 11 Clay ..... 9 Clayey coal ..... 5 Yellow clay ..... 6+

Sections along the outcrop of the Bibby zone of coal beds (Continued)

Location	Description
East side of Bibby branch in the SW. corner NW¼ sec. 14, T. 16 S., R. 3 E.	Small stripping operation (pl. 18 B) at the approximate site of the Bibby pits worked before 1895.[32] The following section was measured at the southwest end of the cut. Coal dips 10°-15°, S. 45° E. Inches Siltstone ..... 12+ Clayey coal ..... 8 Coaly claystone ..... 13 Bright coal ..... 17 Clay ..... 3+
1,000 feet N. and 100 feet E. of the SW. corner sec. 14, T. 16 S., R. 3 E.	Caved pit at the approximate location of the Marion-Thomason pits, site of the principal operation during the period prior to 1895. Gibson reports coal 23 inches thick.[33]
NE¼NE¼ sec. 22, T. 16 S., R. 3 E.	Caved pit at the approximate location of the Black Ankle pits.[34]
1,900 feet S. and 1,800 feet E. of the NW. corner sec. 22, T. 16 S., R. 3 E.	Outcrop of bright coal, 13 inches thick in gully, dips 10°, S. 25° E.
Road cut 2,200 feet S. and 1,400 feet E. of the NW. corner sec. 22, T. 16 S., R. 3 E.	Outcrop of the bed described above. Inches Coaly claystone ..... 3 Clayey coal ..... 17 Clay ..... 1 Clayey coal ..... 3 Clay ..... 2+
Bank of abandoned road 1,400 feet N. and 1,600 feet E. of the SW. corner sec. 22, T. 16 S., R. 3 E.	Outcrop of the bed described above dips 15°+, N. 30° W. Inches Siltstone ..... 24+ Coal ..... 18 Claystone ..... 6+

[32]Gibson, A. M., op. cit., p. 89.

[33]Idem., p. 90.

[34]Idem., pp. 88, 89.

Sections along the outcrop of the Bibby zone of coal beds (Continued)

Location	Description
Road cut 1,200 feet N. and 2,200 feet E. of the SW. corner sec. 22, T. 16 S., R. 3 E.	Outcrop of the bed described above dips 10° northward and is 10 inches thick.
Beside road 2,600 feet S. and 1,600 feet E. of the NW. corner sec. 22, T. 16 S., R. 3 E.	Outcrop of a higher coal bed than the one described above dips 10°, S. 10° E.
	Inches
	Claystone ..... 6+
	Coal 18
	Clayey coal 4
	Silty claystone ..... 6+
In a drainage ditch at the east end of a culvert beneat the road to Odenville, 1,600 feet N. and 2,000 feet E. of the SW. corner sec. 22, T. 16 S., R. 3 E.	The bed described above was exposed for a thickness of 12 inches above the water.
In the abandoned road 2,300 feet N. and 1,100 feet E. of the SW. corner sec. 22, T. 16 S., R. 3 E.	Outcrop of weathered coal 18 inches thick dips 25°-30°, S. 85° E., and overlies a faulted coal bed 20 feet west.

Marion coal.—The Marion coal bed, 710 feet stratigraphically above the Fairview coal is one of the better coals in the area. It has been mined in the northeastern part of the Coal City basin and in the southwestern part of the Fairview basin, and has been prospected extensively in both basins. (See pl. 7.) It is absent or very thin in the northeastern end of the Fairview basin, but southwest of drill hole no. 21 in the SW¼ sec. 16, T. 15 S., R. 4 E. it occurs regularly in drill holes and surface workings as far as sec. 14, T. 16 S., R. 3 E., beyond which it has been removed by erosion.

The Marion bed generally is a single layer of bright coal, but in some places it contains thin clayey partings near the top and the bottom. In the Fairview basin its thickness ranges from 7 to 22 inches and averages 15 inches. In the Coal City basin its thickness ranges from 17 to 28 inches and averages 22 inches.

In the Wattsville area a 2-inch coal bed, called the "shooting seam," occurs about two feet below the Marion bed and is used

to advantage in developing headroom in slopes and entries. A coal bed called the "Marion marker" generally is present from 30 to 35 feet above the Marion bed in the area southwest of drill hole no. 12 in sec. 29, T. 15 S., R. 4 E.

The thickness of the Marion coal bed in core drill holes and in sections along the outcrop at localities shown on plate 7 is indicated in the following tables:

Drill hole no.	Location	Thickness in inches
3	NW¼ sec. 1, T. 16 S., R. 3 E.	22
8	NE¼ sec. 31, T. 15 S., R. 4 E.	17
11	SW¼ sec. 21, T. 15 S., R. 4 E.	13
12	NE¼ sec. 29, T. 15 S., R 4 E.	16
14	SW¼ sec. 29, T. 15 S., R. 4 E.	13
15	NW¼ sec. 21, T. 15 S., R. 4 E.	14
16	NW¼ sec. 13, T. 16 S., R. 3 E.	19
17	SE¼ sec. 1, T. 16 S., R. 3 E.	24
18	SW¼ sec. 1, T. 16 S., R. 3 E.	22*
20	NE¼ sec. 6, T. 16 S., R. 4 E.	17**
21	SE¼ sec. 16, T. 15 S., R. 4 E.	7
22	NW¼ sec. 15, T. 15 S., R. 4 E.	0

* Includes 3 inches of waste.
** Includes 2 inches of waste.

Sections along the outcrop of the Marion coal bed

Reference no. on plate 7.	Location	Description
1	Near the NE. corner SE¼NW¼ sec. 29, T. 15 S., R. 4 E.	Outcrop dips 10°, S. 45° E. Inches Claystone ..... 24+ Coal ..... 1 Clay ..... 3 Coal ..... 1 Clay ..... 2 Clayey coal ..... 3 Coal ..... 14 Gray clay ..... 3+
2	800 feet E. of Pope Chapel in the SE¼ sec. 30, T. 15 S., R. 4 E.	Caved and flooded slope of the Catherine mine.
3	Near the center of the SW¼ sec. 32, T. 15 S., R. 4 E.	Portal of the Layton mine. Coal dips 45°, N. 65° W. at the surface but flattens to 25° 15 feet down the slope.

Sections along the outcrop of the Marion coal bed (Continued)

Reference no. on plate 7.	Location	Description
		Inches
		Siltstone ..... 36+
		Claystone with streaks of coal 48
		Coal 4
		Clay 4
		Coal 1
		Clay 9
		Clayey coal 4
		Coal 18
		Gray clay ..... 18+
4	1,800 feet S. and 2,300 feet E. of the NW. corner sec. 32, T. 15 S., R. 4 E.	Outcrop dips 50°, N. 80° W.
		Inches
		Carbonaceous clay 4
		Clayey siltstone 48
		Clay and coal 6
		Coal 22
		Clay 4
5	900 feet S. and 1,100 feet E. of the NW. corner sec. 28, T. 15 S., R. 4 E.	Inches
		Portal of J. J. Byers prospect.
		Siltstone ..... 36+
		Coal with thin clay lens 6
		Bright coal 9
		Carbonaceous claystone 6
		Coaly claystone 3
		Carbonaceous claystone ..... 14+
6	2,400 feet N. and 2,300 feet W. of the SE. corner sec. 6, T. 16 S., R. 4 E.	Coal in prospect pits dips 25°, S. 80° W.
		Inches
		Sandstone ..... 24+
		Siltstone 30
		Coal 5
		Clay 1
		Coal 17
		Coal and clay 2
		Clay 2
		Coal 2
		Clay ..... 4+
7	1,400 feet S. and 2,100 feet W. of the NE. corner sec. 6, T. 16 S., R. 4 E.	Caved slope of Vaughn and Fay mine. Roof dips 20°, S. 45° W.

Sections along the outcrop of the Marion coal bed (Continued)

Reference no. on plate 7.	Location	Description
8	1,600 feet N. and 2,400 feet E. of the SW. corner sec. 6, T. 16 S., R. 4 E.	Vertical bed of coal 18 inches thick, strikes northeast.
9	2,200 feet N. and 2,500 feet E. of the SW. corner sec. 6, T. 16 S., R. 4 E.	Caved slope of Pike prospect.
10	2,000 feet S. and 800 feet E. of the NW. corner sec. 6, T. 16 S., R. 4 E.	Portal of T. Hammett mine. Inches Claystone ..... 6+ Coal ..... 3 Carbonaceous clay ..... 2 Coal ..... 19 Coaly claystone ..... 2 Clayey coal ..... 3 Carbonaceous claystone ..... 12 Gray claystone ..... 11 Coal ..... 1 Coaly claystone ..... 1 Coal ..... 3 Carbonaceous claystone ..... 18+
11	2,000 feet N. and 900 feet E. of the SW. corner sec. 6, T. 16 S., R. 4 E.	Caved slope of Vulcan no. 6 (Cross-eyed Seven) mine.
12	1,800 feet S. and 100 feet W. of the NE. corner sec. 1, T. 16 S., R. 3 E.	Caved slope of Rutelia mine.
13	1,600 feet S. and 500 feet W. of the NE. corner sec. 1, T. 16 S., R. 3 E.	Caved slope of the Brown-Marion mine.
14	1,600 feet S. and 1,000 feet W. of the NE. corner sec. 1, T. 16 S., R. 3 E.	Caved slope of the Marion mine operated in 1919 by Alexander Tison.
15	2,400 feet S. and 1,800 feet E. of the NW. corner sec. 1, T. 16 S., R. 3 E.	Caved slope of one of the Coosa Coal Company's prospects. Roof dips 30° due south.

Sections along the outcrop of the Marion coal bed (Continued)

Reference no. on plate 7.	Location	Description
16	2,600 feet N. and 900 feet E. of the SW. corner sec. 1, T. 16 S., R. 3 E.	Slope of Coosa Coal Company's Marion mine. Coal dips 18°, S. 13° E. Mr. Leonard Hammett, superintendent of the mine, advised that its slope was about 400 feet long. Three entries were driven to the right, and three to the left. Those on the left were about 200 feet long. The third right entry was also about 200 feet long, but the first and second right entries were about 600 feet long. Most of the coal above the entries had been mined out by the spring of 1946, when the mine was shut down.
16		Inches Siltstone ..... 18+ Carbonaceous claystone .... 8 Coal ..... 23 Carbonaceous claystone .... 3+
17	Near the S. quarter-corner sec. 11, T. 16 S., R. 3 E.	Slope of flooded prospect with thin coal beds in the roof dipping 9°, S. 70° E. J. O. Crance reported that the slope is 50 feet long and the thickness of the principal coal bed is about 2½ feet.
18	SW. corner NE¼NE¼ sec. 12, T. 16 S., R. 3 E.	Outcrop of overturned strata dipping 60° SE. The Marion coal is about 12 inches thick.

Broken Arrow coal.—The Broken Arrow coal bed, approximately 85 feet stratigraphically above the Marion bed, occurs persistently in both basins between drill hole no. 22 in sec. 15, T. 15 S., R. 4 E., and drill hole no. 4 in sec. 14, T. 16 S., R. 3 E. It has been extensively mined in the eastern part of the Coal City field. (See pl. 8.) In the Fairview basin the average thickness of the bed is 40 inches but this includes many claystone partings whose aggregate thickness generally equals or exceeds that of the interbedded coal. (See sections of diamond drill holes, pl. 8.) In the northeastern end of the Coal City basin

the claystone partings almost disappear, and thicknesses of good coal as great as 54 inches were measured. The average thickness in this area, however, is 37 inches. Farther southwest claystone partings again become part of the bed, and in drill hole no. 16 in sec. 13, T. 16 S., R. 3 E., where the bed is 41 inches thick, these partings constitute more than half of it. The thickness of the Broken Arrow coal in diamond drill holes and in sections measured on the outcrop is shown in the following tables and is illustrated graphically on plate 8.

Thickness of the Broken Arrow coal bed in diamond drill holes

Drill hole no.	Location	Thickness in inches: Coal	Included waste	Total thickness of bed
8	NE¼ sec. 31, T. 15 S., R. 4 E.	21½	27½	49
11	SW¼ sec. 21, T. 15 S., R. 4 E.	5½	2	7½
12	NE¼ sec. 29, T. 15 S., R. 4 E.	15	25	40
14	SW¼ sec. 29, T. 15 S., R. 4 E.	32	27	59
15	NW¼ sec. 21, T. 15 S., R. 4 E.	29	33	62
16	NW¼ sec. 13, T. 16 S., R. 3 E.	20	21	41
17	SE¼ sec. 1, T. 16 S., R. 3 E.	39	11	50
18	SW¼ sec. 1, T. 16 S., R. 3 E.	22	5	27
21	SE¼ sec. 16, T. 15 S., R. 4 E.	16½	32½	49

Sections along the outcrop of the Broken Arrow coal bed

Reference no. on plate 8.	Location	Description
1	SE. corner sec. 20, T. 15 S., R. 4 E.	Outcrop in railroad cut dips 20° eastward.

	Inches
Siltstone	96+
Claystone	15
Coal	4
Clay with coaly streaks	3
Coal	14
Clay with coaly streaks	5
Claystone	25
Clay and coal in thin alternating beds	12
Claystone	13
Coal	4
Claystone	36+

Sections along the outcrop of the Broken Arrow coal bed (Continued)

Reference no. on plate 8.	Location	Description
2	NE¼NE¼ sec. 29, T. 15 S., R. 4 E.	Prospect pit beside a fault. Distorted coal bed dips 50°, N. 50° W.

	Inches
Sandstone (hangingwall)	48+
Claystone (footwall)	6
Coal	2
Gray claystone	6
Coaly claystone	4
Gray claystone	4
Ferruginous claystone	4
Carbonaceous claystone	10
Coal	2
Carbonaceous claystone	6
Coal	7
Coaly claystone	1
Carbonaceous claystone	14
Coal	2
Carbonaceous claystone	6+

3	NE. corner SE¼SW¼ sec. 31, T. 15 S., R. 4 E.	Outcrop in logging road and nearby pit dips 5°, N. 20° E.

	Inches
Siltstone	120+
Coal	6
Claystone	120
Coal	4
Coaly clay	2
Carbonaceous clay	5
Coaly clay	2
Coal	15
Gray clay	9+

4	2,200 feet S. and 2,300 feet W. of the NE. corner sec. 6, T. 16 S., R. 4 E.	Prospect slope 200 feet north of Rodney Crump mine. Coal dips 30°, N. 60° W.

	Inches
Ferruginous claystone	120+
Coal	3
Carbonaceous claystone	2
Clayey coal	2
Bright coal	20
Friable coal	12
Coaly clay	10
Carbonaceous clay	3
Gray clay	1+

Sections along the outcrop of the Broken Arrow coal bed (Continued)

Reference no. on plate 8.	Location	Description
5	1,500 feet S. and 2,300 feet W. of the NE. corner sec. 6, T. 16 S., R. 4 E.	Site of the Hudson strip mines and subsequent underground mining by various operators.
6	Chiefly in the NE¼ SW¼ sec. 6, T. 16 S., R. 4 E.	Three caved slopes and several subsidiary openings along a northward striking segment of the Broken Arrow bed. The most northerly working is the Gould slope. In the most southerly slope 32 inches of bright coal is exposed above the cavings.
7	2,000 feet S. and 1,300 feet E. of the NW. corner sec. 6, T. 16 S., R. 4 E.	Distorted coal beneath a thrust fault dipping 20° southwest.
8	SE¼SW¼ sec. 6, T. 16 S., R. 4 E.	Outcrop of nearly vertical coal in road. Caved workings occur northeast and southwest of the road.

	Inches
Siltstone	120+
Clay	30
Clayey coal	3
Clay	4
Coal	39
Clay	7
Coal	1
Clay	24+

9	2,400 feet N. and 1,600 feet E. of the SW. corner sec. 6, T. 16 S., R. 4 E.	Caved slope of Vulcan no. 3 mine.
10	1,800 feet N. and 600 feet E. of the SW. corner sec. 6, T. 16 S., R. 4 E.	Caved slope of Vulcan no. 4 mine.

Sections along the outcrop of the Broken Arrow coal bed (Continued)

Reference no. on plate 8.	Location	Description
11	NW¼SW¼ sec. 6, T. 16 S., R. 4 E.	Blanton strip mine in the Broken Arrow bed. (See pl. 21 A.) Coal dips 13°-20° W., thickness ranges from 49 to 54 inches. The following section was measured in the south end of the workings. Inches Fine-grained bluish-gray sandstone ..... 48 Claystone ..... 8 Claystone with ferruginous concretions ..... 18 Carbonaceous claystone ..... 8 Coaly claystone ..... 2 Carbonaceous claystone ..... 19 Coaly claystone ..... 3 Bone coal ..... 2 Coal ..... 3 Coaly claystone ..... 3 Coal ..... 49 Carbonaceous claystone ..... 6+
12	2,100 feet S. and 100 feet W. of the NE. corner sec. 1, T. 16 S., R. 3 E.	Caved workings of the Eureka mine.
13	1,900 feet S. and 1,100 feet W. of the NE. corner sec. 1, T. 16 S., R. 3 E.	Broken Arrow mine owned in 1919 by Alexander Tison.
14	2,600 feet S. and 1,400 feet E. of the NW. corner sec. 1, T. 16 S., R. 3 E.	Slope of the Smith-Broken Arrow mine. Coal dips 25°, S. 3° W. Inches Silty claystone ..... 42 Carbonaceous claystone ..... 10 Clayey coal ..... 6 Coal ..... 29 Carbonaceous clay ..... 2+
15	2,300 feet S. and 900 feet W. of the NE. corner sec. 11, T. 16 S., R. 3 E.	Silt-filled pit dug by Hobson Warren who reported that it contained bright coal from 24 to 25 inches thick.

PLATE 21 A. Blanton's strip mine in the Broken Arrow coal bed in the NW¼SW¼ sec. 6, T. 16 S., R. 4 E.

Inman coal.—The Inman coal bed was mined extensively prior to 1858 in the Coleman mines[35] on Inman Branch in the NE¼ sec. 21, T. 15 S., R. 4 E., and about the year 1900 in the Inman mines in the same locality. In this area the Inman coal bed is about 210 feet stratigraphically above the Broken Arrow coal. Erosion has removed the Inman coal bed from the rest of the Fairview basin, but it occurs in the northeastern end of the Coal City basin, where it is found between 140 and 210 feet above the Broken Arrow coal bed.

Along Inman Branch the coal lies between two thick sandstone beds which thin to the southwest and change to a shale facies. (See pl. 3.) The coal also becomes thinner and clayey southwestward. These changes in facies and thickness, and the fact that the Inman coal is absent for almost six miles probably are responsible for the erroneous correlation in the past of the Inman bed with the Coal City (Coal Branch) bed.

The Inman bed in the Fairview basin is a single layer of bright coal, reported to have been much esteemed in the market.

[35]Tuomey, Michael, Second biennial report on the geology of Alabama: Geol. Survey of Alabama, p. 286, 1858.

The Coal City coal bed occurs only within an area about two miles long and a half mile wide in the northeastern part of the Coal City basin. Here it is 20 to 90 feet above the Inman coal bed and 1,045 to 1,166 feet above the Fairview coal bed. Although the intervals between the Coal City and Fairview beds suggest that the Coal City coal should be present in the rugged hills southeast of Inman Branch, the northeastward thickening of the rocks in this part of the section appears to have carried the Coal City coal above the present tops of the hills.

The Coal City bed has been extensively mined in the northeastern part of its area of occurrence where it consists of a lower part of clean coal ranging in thickness from 39 to 50 inches, and an upper part consisting of thin interbedded coal and claystone 24 inches thick. (Pl. 22 A.) The upper part becomes more shaly southwestward and is represented by a thin coal "marker" about two feet above the lower part in the Smith and Lawley mines. (See localities 14 and 15, plate 9.) The lower part of the bed thins to the south as shown by thicknesses of 59 inches near the portal of the Smith mine, 37 inches in the Lawley mine, and 22 inches in drill hole no. 16.

Prospectors searching for this coal have been guided by detrital accumulations of milky quartz pebbles often concentrated a few feet above the bed. Actually these pebbles were derived from the upper part of a thick sandstone bed about 200 feet stratigraphically above the coal.

Sections along the outcrop of the Coal City bed and some of the workings in it are described in the following table. (See pl. 9.)

Sections and workings along the outcrop of the Coal City coal bed

Reference no. on plate 9.	Location	Description
1	NE¼NE¼ sec. 12, T. 16 S., R. 3 E.	Outcrop in highway cut dips 80°, N. 25° W.

	Inches
Siltstone	60+
Claystone with ferruginous concretions	10
Claystone	17
Coal and clay	8

Sections and workings along the outcrop of the Coal City coal bed (Continued)

Reference no. on plate 9.	Location	Description
		Carbonaceous claystone ..... 10 Ferruginous siltstone ..... 10 Fire clay ..... 2 Coal ..... 39 Siltstone ..... 60+
2	NE¼NE¼ sec. 12, T. 16 S., R. 3 E.	Pit beside old road exposes overturned strata dipping 60°, S. 30° E. The coal bed consists of coal 4 feet thick overlain by coal and clay 2 feet thick.
3	SW¼SW¼ sec. 6, T. 16 S., R. 4 E.	Portal of Frank Vaughn slope driven along the overturned coal bed which dips 60°, S. 35° E.
4	SW¼SW¼ sec. 6, T. 16 S., R. 4 E.	Portal of Glenn mine operated during 1915, and south end of Blanton's strip mine on the Coal City bed worked during 1946. (See pl. 21 B.) According to men who worked in the Glenn mine, it was developed for a distance of about 500 feet down the dip where a steep rise was encountered. A

PLATE 21 B. Blanton's strip mine in the Coal City bed in the SW¼SW¼ sec. 6, T. 16 S., R. 4 E.

Sections and workings along the outcrop of the Coal City coal bed (Continued)

Reference no. on plate 9.	Location	Description
		slope 100 to 200 feet long was driven up this rise to its crest and far enough beyond to indicate that the slope had changed again, resuming the southwest dip normal for this locality. Mining on this anticline was stopped because of the difficulty of hauling coal cars over its crest. The following section was measured in the face of the Blanton pit beside the Glenn slope. Beds dip 15°, S. 65° W.

	Inches
Claystone with ferruginous concretions	13
Gray silty claystone	18
Carbonaceous claystone	3
Coal	5
Clay with streaks of coal	5
Clay	2
Coal	2
Clay	2
Clayey coal	3
Coal	49
Carbonaceous claystone	2+

5	SE¼SE¼ sec. 1, T. 16 S., R. 3 E.	Caved slopes of D. B. Moore mine where the Coal City coal bed was first mined about 1880.
6	NE¼SE¼ sec. 1, T. 16 S., R. 3 E.	Caved workings from Dorset mine, exposed coal dipping 25° SW.
7	NE¼SE¼ sec. 1, T. 16 S., R. 3 E.	Two abandoned slopes; the northwest one driven by Alverson and Moore, and the southeast by Dorset at a later date.
8	NW¼SE¼ sec. 1, T. 16 S., R. 3 E.	Pit in the east bank of Broken Arrow Creek reported by several miners to contain coal 4 feet thick.
9	NW¼SE¼ sec. 1, T. 16 S., R. 3 E.	Caved portal of Kimber mine.
10	NE¼SW¼ sec. 1, T. 16 S., R. 3 E.	Portal of Coal Branch mine no. 3 operated by the Seaboard Coal and Coke Company in 1912 and the Coal City Mining Corporation in 1915.

Sections and workings along the outcrop of the Coal City coal bed (Continued)

Reference no. on plate 9.	Location	Description
11	Near the center of the SW¼ sec. 1, T. 16 S., R. 3 E.	Caved workings of Vulcan no. 2 operated in 1912 by the Seaboard Coal and Coke Co., and in 1915 by the Coal City Mining Corp.
12	SW¼SW¼ sec. 1, T. 16 S., R. 3 E.	Klondike mine.
13	NW¼NW¼ sec. 12, T. 16 S., R. 3 E.	Coal Branch mine no. 5.
14	SW¼NW¼ sec. 12, T. 16 S., R. 3 E.	Smith mine. The following section was measured in an excavation near the portal which showed the beds dipping 17° E.

	Inches
Clay	6+
Coal	3
Clay	32
Coal and clay	5
Coal	57
Carbonaceous clay	2+

15	SE¼NE¼ sec. 11, T. 16 S., R. 3 E.	Lawley mine. Slope driven about 75 feet eastward to a fault where a winze 20 feet deep was sunk without finding the offset bed. All other mining was south of the slope. Coal in slope dips 25°, N. 80° E. The following section was measured at the portal.

	Inches
Clay	15+
Coal	3
Clay	20
Coal	1
Carbonaceous clay	2
Coal	21
Coaly clay	1
Coal	3
Clayey coal	9
Yellow clay	3+

16	SE¼NW¼ sec. 11, T. 16 S., R. 3 E.	Two silt-filled pits dug by Hobson Warren who reported that the eastern pit contained a coal bed from 30 to 32 inches thick.
17	NW¼NW¼ sec. 13, T. 16 S., R. 3 E.	Caved pit on vertical bed.

Brewer coal.—The Brewer coal bed occurs within an area about one and a half miles long and half a mile wide in the highlands of the northeastern end of the Coal City basin. It consists of alternating layers of coal and carbonaceous claystone that are 81 inches thick in the northeastern end of the area of occurrence, but thin rapidly to the southwest. The bed was cored in drill hole no. 16 only, where 11 inches of coal were found. The maximum thickness of the bed was measured in a prospect slope near Coosa Coal Company's mine no. 7 which is shown in the first of the two following sections:

Sections along the outcrop of the Brewer coal bed

Location	Description
2,120 feet W. and 1,060 feet N. of the SE. corner sec. 1, T. 16 S., R. 3 E.	Beds dip 20 °, S. 65° W. Two measurements were taken on the right wall 25 to 40 feet from the portal and one on the left wall 20 feet from the portal. The average of these measurements is shown in the following section:

	Inches
Carbonaceous claystone (roof)	2+
Coal	4
Carbonaceous claystone	2
Coal	3
Clayey coal	4
Coal	2
Carbonaceous claystone	4
Coal	4
Carbonaceous claystone	6
Coal	6
Carbonaceous claystone	18
Coal	17
Carbonaceous claystone	3
Coal	3
Clayey coal	5
Carbonaceous claystone	2+

2,400 feet N. and 550 feet E. of the SW. corner sec. 12, T. 16 S., R. 3 E.	Beds in shallow prospect pit dip 15°, N. 60° E.

	Inches
Claystone	60+
Coal	1½
Clay	0½
Coal	2
Clayey coal	1
Coal	1
Clay	1
Coal with streaks of clay	6
Claystone	8+

Hammond coal.—The Hammond coal bed, the youngest coal in the Pottsville of this area, is about 10 feet stratigraphically above the Brewer bed, and, like the Brewer, it is exposed only in a small area over the deepest part of the Coal City basin. It reaches its maximum thickness of 91 inches in the mines of the Coosa Coal Company in sections 1 and 12, T. 16 S., R. 3 E. (see pl. 10), but thins rapidly to the southwest. In the mines it is composed of three "ledges" of coal separated by two claystone partings. The coal "ledges," which generally include some clayey lenses, have average thicknesses from the highest to the lowest of 25, 15, and 12 inches, respectively, and the partings average 15 and 13 inches in the same order. Thinning of the Hammond coal to the southwest is indicated by comparing these thicknesses with the thickness of the bed in the Yorty prospect (locality 8, plate 10), where the bed is less than 24 inches thick and contains a large proportion of clay. Thinning continues southward as indicated by the recovery of only 10 inches of coal and claystone from this horizon in drill hole no. 16, a quarter of a mile south of the Yorty prospect. The following sections, measured along the outcrops, show the character of the bed.

Sections and workings along the outcrop of the Hammond coal bed

Reference no. on plate 10.	Location	Description
1	NE. corner of the NW¼NE¼ sec. 12, T. 16 S., R. 3 E.	Coosa Coal Company mine no. 4 (Dirty Dozen mine). Beds dip 23°, S. 60° W.

	Inches
Silty claystone	60+
Coal	2
Claystone	27
Coal	2
Clay	2
Coal	12
Coaly clay	1
Coal	15
Silty clay	9
Coal	21
Clay	15
Coal	3
Bone coal	2
Coal	8+
Water	

Sections and workings along the outcrop of the Hammond coal bed (Continued)

Reference no. on plate 10.	Location	Description
2	NE¼NE¼ sec. 12, T. 16 S., R. 3 E.	Beds in prospect pit dip 20°, S. 85° W.

	Inches
Coal and clay	7
Coal	17
Clay	2
Coal	10
Carbonaceous clay	21
Coaly clay	7
Coal	12+
Water	

3	SW¼SE¼ sec. 1, T. 16 S., R. 3 E.	Coosa Coal Company mine no. 5. Beds dip 24°, S. 87° W.
4	NW. corner of the SW¼SE¼ sec. 1, T. 16 S., R. 3 E.	Coosa Coal Company's mine no. 7, operated in 1946. Beds dip 15°, S. 25° W. The following section was measured in the left rib, 75 feet from the mouth of the first left entry.

	Inches
Carbonaceous claystone	36+
Coal	23
Carbonaceous claystone	16
Coal	16
Carbonaceous claystone	10
Coal	26
Carbonaceous claystone	3+

5	Near the SW. corner SE¼ sec. 1, T. 16 S., R. 3 E.	Coosa Coal Company's mine no. 6. Beds dip 14°, S. 50° W. Measurements made 30 feet from the portal.

	Inches
Coal	2
Carbonaceous clay	3
Coal	2
Bone coal	1
Coal	5
Clayey coal	12
Silty carbonaceous clay	24
Coal	16
Clay	10
Coal	8
Clay	2+

Sections and workings along the outcrop of the Hammond coal bed (Continued)

Reference no. on plate 10.	Location	Description
6	SE¼SW¼ sec. 1, T. 16 S., R. 3 E.	Portal of the Pike and Jones mine.

	Inches
Coal	18
Silty claystone	21
Coaly claystone	2
Bony coal	6
Coal	7
Clay	9
Coal	14

7	SE¼SW¼ sec. 1, T. 16 S., R. 3 E.	Caved pit containing approximately vertical Hammond and Brewer beds.
8	NE. corner SW¼SW¼ sec. 12, T. 16 S., R. 3 E.	Portal of caved slope of H. A. Yorty prospect. Beds dip 0° to 5° eastward.

	Inches
Siltstone	60+
Carbonaceous clay	3
Clay	5
Coal	1
Gray clay	14
Clayey coal	5
Clay	3
Coal	4
Clay and coal	8
Gray clay	6+

9	SW. corner SW¼ sec. 12, T. 16 S., R. 3 E.	Caved entry reported to be about 30 feet long.

	Inches
Siltstone	48+
Clay	3
Clay with streaks of coal	3
Carbonaceous clay	13
Clay with streaks of coal	3
Coal	6
Clay and coal	8
Clay	4
Clay with streaks of coal	3+

10	NW¼NW¼ sec. 13, T. 16 S., R. 3 E.	Flooded Crance and Vaughn mine. Reported by J. O. Crance to extend about 500 feet northwest and to contain a coal bed about 23 inches thick.

Quality of the Coal

The coal in the Coal City and Fairview basins is of high volatile bituminous A, and medium volatile bituminous ranks. It has been used for domestic purposes, for generating steam, and for making coke, although, because of the generally high sulfur and ash content, it is unsuited for making metallurgical coke. Coal from some beds, such as that from the Fairview bed, slacks on exposure to the weather, but fragments of coal beside workings in the Coal City, Broken Arrow, and Marion beds are hard after exposure as long as 20 years. The ash content, on a moisture-free basis, of core samples from all the beds ranges from 3.0 to 22.7 percent, the lower percentage occurring in the Marion and Coal City beds. On the same basis the sulfur content ranges from .2 to 7.2 percent. Complete information on the chemical properties and washability characteristics of the coal will appear in a forthcoming publication of the Bureau of Mines.[36] A summary of some of the analyses made by the Bureau of Mines is given in the following table:

Excerpts from coal analyses of cores and outcrop samples*

Name of coal bed	No. of Samples	Percentages (moisture free basis) Ash			Sulfur		
		Average	Maximum	Minimum	Average	Maximum	Minimum
Hammond							
Top Ledge	1	14.3	.....	.....	1.7	.....	.....
Middle ledge	1	11.9	.....	.....	0.9	.....	.....
Bottom ledge	1	10.4	.....	.....	1.1	.....	.....
Brewer	1	39.2	.....	.....	1.5	.....	.....
Coal City	2	4.9	5.1	4.6	0.7	1.1	0.2
Broken Arrow	1	9.2	.....	.....	0.9	.....	.....
Marion	7	8.5	13.6	3.0	3.0	5.9	0.8
Bibby	5	13.4	18.5	10.1	5.1	6.0	3.9
Brown	2	28.7	29.2	28.3	10.1	.....	.....
Gann	3	9.0	12.3	5.0	3.9	5.9	1.7
Higginbotham	3	10.0	11.0	10.1	2.1	3.0	1.5
Fairview	34	14.0	22.7	8.3	4.0	7.2	1.2
Upper Chapman	2	8.8	9.7	8.0	2.8	3.9	1.8

* Analyses made in the Coal Constitution Laboratory, U. S. Bureau of Mines, Pittsburgh, Pennsylvania.

[36]Toenges, Albert L., Turnbull, Louis A., Jolley, Theodore R., et. al., Investigation of coal deposits in the Fairview and Coal City basins of the Coosa coal field, St. Clair County, Alabama: The reserves, petrography and chemical properties of the coals; the washability characteristics of the coal from the Fairview bed; and the geology of the area: U. S. Bureau of Mines Tech. Paper 719.

Reserves of Coal

The reserves of coal computed herein represent the quantity of coal in the ground, a figure that must be reduced to indicate thet onnage that may be extracted. The Fairview bed in the Fairview basin is best suited for modern mechanized mining, and in the greater part of the basin (see area A, pl. 5) it is believed by the Bureau of Mines that 80 percent of the coal in this bed can be recovered.[37]

The percentages of recovery from other beds may be somewhat less than this figure because of their different physical characteristics, and it is certain to be much less in the part of the Coal City basin that is cut by the closely spaced transverse faults. The dip of the beds was disregarded in computing their area. The factor 1740 tons per acre per foot was used to convert the volume of coal bed to tons of coal in place.

The reserves shown in the following tables are divided into two groups according to the thickness of the beds. One group includes coal from single or composite beds in which the aggregate thickness of the coal is 20 inches or more and the thickness of the partings is not excessive as explained below. The other group includes single beds that range in thickness from 14 to 19 inches.

As the principal beds in this area are composite and contain partings or waste more than 6 inches thick, the ratio between the thickness of coal and waste that can be mined is a factor of primary importance in estimating coal reserves. To determine the practice of mines in this region a study was made of 111 measured coal sections in 37 mines in the Warrior and Cahaba coal fields[38] and the graph, figure 5, was prepared.

The total thickness of the layers of coal in each section was plotted along the abscissa and the total thickness of the included waste in the section was plotted along the ordinate. The line 0-B, originating at (20, 6) was drawn so that all but a few of the points lie to its right, and, therefore, it indicates the greatest amount of waste that was profitably mined with

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[37]Toenges, Albert L., et. al., op. cit.

[38]Butts, Charles, Analysis of Alabama coals: Geol. Survey of Alabama Bull. 31, 1926.

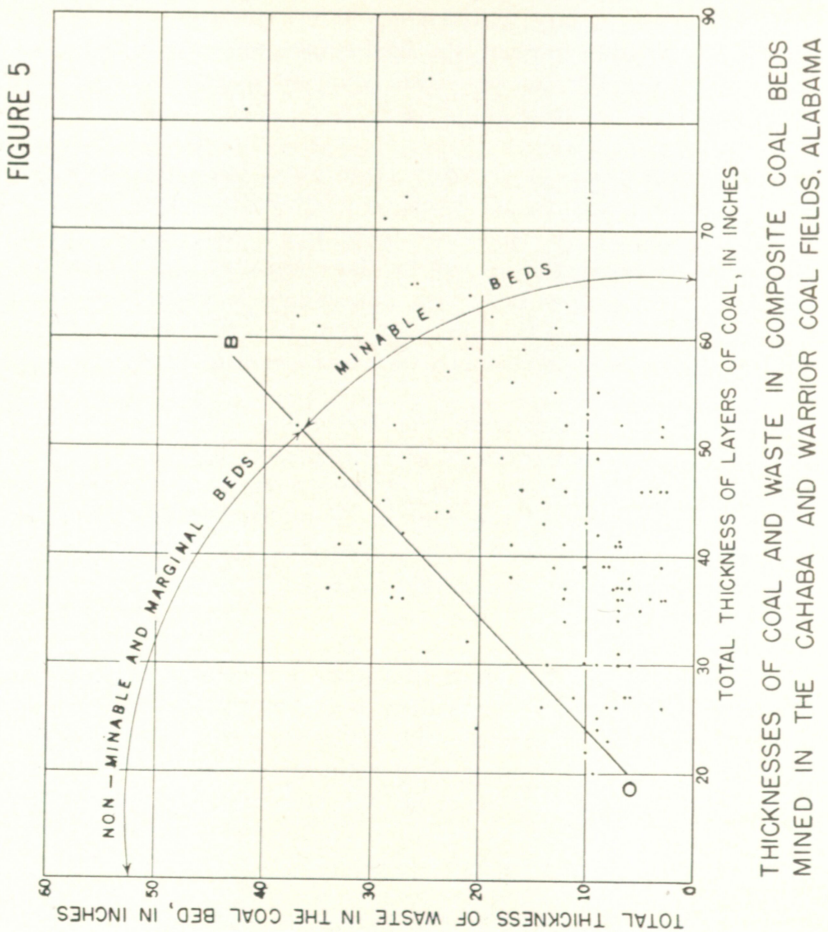

FIGURE 5. Thickness of coal and waste in composite coal beds mined in the Cahaba and Warrior coal fields, Alabama.

various thicknesses of coal. A few beds were mined that show lower ratios of coal to waste but, in the interest of conservatism, these examples were disregarded in applying the ratios shown by graph to composite beds in the Coal City and Fairview basins.

The reserves are also classified according to the completeness of the available information into (1) measured, (2) indicated, and (3) inferred groups. Measured reserves of coal are those in beds of demonstrated regularity for which reliable observations have been made at intervals approximately half a mile apart, and for which the geology is known. Indicated reserves are similar to measured reserves with respect to the information available except that points of observation are spaced at intervals ranging from half a mile to a mile. Inferred reserves are determined largely by geological interpretation and are supported by the following types of evidence: (1) observations more than a mile apart, or (2) data that contain appreciable amounts of credible hearsay evidence. In this class also are reserves contained in beds known to be irregular in thickness, extent, or quality or to contain relatively large mines of uncertain extent.

Reserves were computed for the Fairview coal bed, which contains more than half of the total reserves, and for the Hammond, Coal City, Broken Arrow, Marion, Gann, and Upper Chapman Coal beds. The other coal beds were too thin, irregular, or low-grade to be included in the reserves.

Reserves of Fairview Coal.—Reserves of coal in the Fairview bed were computed for its entire area of occurrence northeast of sec. 14, T. 16 S., R. 3 E., except for small areas around drill holes nos. 10, 11, and 13, an area including drill holes nos. 3, 19, and 20, and an area in the vicinity of the Soot Creek mine. (See locality 13, pl. 5.) The bed in drill hole no. 13 contains too much ash, and in the other drill holes it is too thin to be included with the reserves. The various types and thicknesses of reserves into which the area of occurrence is divided are indicated by blocks A to G on plate 5 and are tabulated below.

Reserves in place in the Fairview coal bed

Block plate 5	Inches thick	Acres*	Reserves (short tons) Measured	Indicated	Inferred	Total of all classes
			Thickness of the coal is 20 inches or more			
A	28	3,307	13,430,000**			
B	26	262			990,000	
E	40	106		616,000		
F	23	99		331,000		
A	28	3,307	13,430,000			
EF	32	205		947,000		
B	26	262			990,000	
A BEF	28	3,774				15,367,000
			Thickness of the coal ranges from 14 to 19 inches			
C	15	156		340,000		
D	17	115		284,000		
G	14	179			360,000	
H	16	919			2,199,000	
CD	16	271		624,000		
GH	16	1,098			2,559,000	
CD GH	16	1,369				3,183,000

*Fractions of acres, used in computations, not shown.

**Area of Fairview coal believed to offer the best possibilities for future development.[39]

Reserves of Hammond coal.—The reserves of coal in the Hammond bed are in a single block in the highlands south of the Coosa Coal Company's mines. (See pl. 10.) This block is placed in the inferred class because of the scarcity of outcrops and the lack of information about the thickness of the coal south of the workings. The segments of the bed southwest of block A are too small or contain too little coal to be included with the reserves. The dimensions and tonnage of black A are as follows:

Reserves in place in the Hammond coal bed

Block A (inferred reserves)

Area	77 acres
Thickness	36 inches
Reserves	400,000 short tons

[39] Toenges, A. L., et al, op. cit.

Reserves of Coal City coal.—Reserves of coal in the Coal City bed are represented by three blocks, each in a different class. Block A (see pl. 9 contains measured reserves and consists of the unmined southward extension of the Lawley mine and a part of the unexploited fault block between the Smith and Lawley mines. Block B, the southward extension of block A, is classified as indicated coal because of the scarcity of data regarding its thickness. Block C, surrounded by some of the best mines in the Coal City bed, is classed as inferred reserves because of the uncertainty regarding the extent of some of the adjacent workings. The Kimber and Coal Branch no. 3 mines (localities 9 and 10, pl. 9) were surveyed and their limits are probably as indicated, but the extent of the workings from the Alverson and Moore, and Dorset entries (locality 7, pl. 9) was determined from hearsay evidence, and, therefore, is questionable. Reserves for the various blocks are given in the following table:

Reserves in place in the Coal City coal bed

Block plate 9	Inches thick	Acres	Reserves (short tons) Measured	Indicated	Inferred	Total of all classes
			Thickness of the coal is 20 inches or more			
A	37	32	170,000			
B	26	167		630,000		
C	46	75			500,000	
ABC	35	274				1,300,000

Reserves of Broken Arrow coal.—The reserves of coal in the Broken Arrow bed are chiefly in the northeast end of the Coal City basin, but a small area, block A, occurs in the adjoining part of the Fairview bason. (See pl. 8.) The Broken Arrow bed in the remainder of the area of occurrence either is mined out or contains too many partings to be minable. Block B, the only area containing this coal in thickness greater than 20 inches, is classified as indicated reserves because of the lack of an observation between drill holes nos. 16 and 17 and because of some uncertainty as to the extent of the Broken Arrow and Eureka mines (localities 13 and 12, pl. 8). Reserves for these blocks are given in the following table:

Reserves in place in the Broken Arrow coal bed

Block plate 8	Inches thick	Acres	Reserves (short tons) Measured	Indicated	Inferred	Total of all classes
			Thickness of the coal is 20 inches or more			
B	27	324		1,270,000		
			Thickness of the coal ranges from 14 to 19 inches			
A	14	80	120,000			
C	16	176		410,000		
AC	15	256				530,000

Reserves of Marion coal.—Reserves of coal in the Marion bed occur in the southwest end of the Fairview basin and in the northeast end of the Coal City basin. (See pl. 7.) Coal, 20 inches or more in thickness, occurs only in the vicinity of the mines in the areas designated as blocks D, E, and F. Block E is classified as inferred because of uncertainty regarding the extent of the adjacent workings in the Rutelia and Marion mines, localities 12 and 14, pl. 7. The other blocks have varied classifications depending upon the amount of available information. Reserves are given in the following table:

Reserves in place in the Marion coal bed

Block plate 7	Inches thick	Acres	Reserves (short tons) Measured	Indicated	Inferred	Total of all classes
			Thickness of the coal is 20 inches or more			
D	20	49	140,000			
E	21	146			440,000	
F	21	157	480,000			
DF	21	206	620,000			
DEF	21	352				1,060,000
			Thickness of the coal ranges from 14 to 19 inches			
A	15	398	360,000			
B	17	499		1,230,000		
C	19	77	210,000			
G	17	1,020			2,510,000	
AC	16	475	1,070,000			
A BCG	17	1,994				4,810,000

Reserves of Gann coal.—The reserves of coal in the Gann coal bed occur in two blocks, one at each end of the Fairview basin. (See pl. 6.) The bed is less than 20 inches thick in both localities, the dimensions and reserves of which are shown in the following table:

Reserves in place in the Gann coal bed

Block plate 6	Inches thick	Acres	Reserves (short tons) Measured	Indicated	Inferred	Total of all classes
		Thickness of the coal ranges from 14 to 19 inches				
A	14	190		390,000		
B	14	626	1,270,000			
AB	14	816				1,660,000

Reserves of Upper Chapman coal.—The reserves of coal in the Upper Chapman coal bed consist of two small blocks, A and B, in the Fairview basin in the vicinities of drill holes nos. 9 and 10, where coal 16 and 17 inches thick, respectively, was cored. At three other localities within the area of occurrence (outcrop no. 5, and drill holes nos. 2 and 8, pl. 4) the coal is 14 or more inches thick, but the areas in which this thickness is maintained are too small or too far removed from the outcrop or the coal is too clayey to be considered as reserves. The reserves of the bed are shown in the following table:

Reserves in place in the Upper Chapman coal bed

Block plate 4	Inches thick	Acres	Reserves (short tons) Measured	Indicated	Inferred	Total of all classes
		Thickness of the coal ranges from 14 to 19 inches				
A	18	235		610,000		
B	15	244		530,000		
AB	16	479				1,140,000

Historical Summary of Coal Mining

Coal was first reported in the Coosa field by Jones in 1834, who mentions an occurrence in the falls of the Coosa River[41] (probably in the Ragland basin). The earliest record of coal in the mapped area was by Tuomey, who stated in 1850 that coal was dug from one of two beds each five feet thick on Broken Arrow Creek (in the Coal City basin), and transported by barge down the Coosa River to Montgomery where it was sold for forty cents a bushel.[42] A much later report by Hays, however, indicates that mining near Fairview, conducted between 1843 and 1847 may have antedated that at Coal City.[43] Between 1850 and 1858 development was extended to the southwest end of the Coal City basin by mining on one of the Chapman coal beds in sec. 27, T. 16 S., R. 3 E., and was expanded in the Fairview basin by operations on the Upper Chapman bed on the Barber farm in sec. 17, T. 15 S., R. 4 E. (probably the Kitchens prospect, locality 3, pl. 4). At this time also the Coleman mines on Inman Branch in sec. 21, T. 15 S., R. 4 E., yielded large quantities of coal which were hauled to the Coosa River for shipment by barge to lower river ports.[44] Mining was resumed near Fairview in 1855 by the Fairview Mining Company, which operated a mine near Fairview Station on the East and West Railroad,[45] whose right-of-way was abandoned in 1903 but can still be followed through the valley of Inman Branch. A short time before the Civil War, a Mr. Hudson opened a mine north of Broken Arrow Creek in sec. 6, T. 16 S., R. 4 E.[46] (probably locality 5, pl. 8).

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[41]Jones, Alexander, Bituminous coal: Amer. Jour. of Science and Art, vol. XXVI, pp. 120-121, July 1834.

[42]Tuomey, Michael, First biennial report on the geology of Alabama: Geol. Survey of Alabama, pp. 75-76, 1850.

[43]Hayes, Charles W., U. S. Geol. Survey 22nd Ann. Rept., pt. 3, pp. 245-246, 1901.

[44]Tuomey, Michael, Second biennial report on the geology of Alabama: Geol. Survey of Alabama, p. 286, 1858.

[45]Jones, Walter B., Index to the mineral resources of Alabama: Geol. Survey of Alabama, Bull. 28, p. 100, 1926.

[46]Gibson, A. M., Report upon the Coosa coal field: Geol. Survey of Alabama Special Rept. 7, p. 70, 1895.

During the Civil War "much coal was won from this region for the use of the Confederate States' Arsenal at Selma, Alabama,"[47] and among these operations was the discovery of the Hammond bed in the strip pits near the southeast corner of the SW¼ sec. 1, T. 16 S., R. 3 E.[48] The first extensive operation on the Coal City bed was begun about 1880 by D. B. Moore at workings a quarter of a mile south of Broken Arrow Creek[49] (locality 5, pl. 9. As these workings were on the outskirts of Coal City (now called Wattsville), the bed was named for the settlement. In 1882 the Broken Arrow Coal Company began developing the Broken Arrow Mine (locality 13, pl. 8), but abandoned the operation when the fault southwest of the portal was encountered. The property was subsequently acquired by the Eureka Company which resumed development of the bed at the Eureka mine about 1,000 feet east of the Broken Arrow mine[50] (locality 12, pl. 8). During the following years mining continued, but judging from the literature it was intermittent. The Coal City bed was traced northward and in 1890 was developed by the Coal City Mining Company at the Alverson and Moore mine (locality 7, pl. 9). In 1893 this mine yielded 50,000 tons of coal.[51] Near the turn of the century the mines on Inman Branch were reopened and the Coal City bed on Coal Branch, discovered in 1898,[52] was extensively developed.

No complete record has been made of the amount of coal that has been mined from the area, chiefly because the yield has been reported by counties rather than by districts, but a partial history of operations may be obtained from the Statistics of Mineral Production of Alabama issued periodically by the Geological Survey of Alabama. In 1903 the Coal City area and the Ragland field yielded 121,000 tons of coal.[53] The next record of output is in 1915 when 60,604 tons was marketed from six mines, Coal Branch no. 3, Coal Branch no. 5, Glenn, Vulcan no. 2, Seaboard no. 1, and Smith-Coal City, in the Coal City

[47]Idem., p. 69.
[48]Idem, p. 80.
[49]Idem., p. 71.
[50]Idem., pp. 71-73.
[51]Idem., p. 75.
[52]Oral communication by Hobson Warren.
[53]Smith, Eugene A., and McCalley, Henry, Index to the mineral resources of Alabama: Geol. Survey of Alabama Bull. 9, p. 26, 1904.

area.[54] During the next decade mining rights to many of the known coal deposits were acquired by Watt T. Brown, who contracted with various individuals for the development or operation of most of them. The yield from these operations is not a public record. In 1938 the Fay Mining Company and the Zukor Coal Company marketed 10,926 tons from the Marion bed,[55] and in 1943 the Coosa Coal Company mined 8,437 tons from the Marion mine on the same bed.[56] This mine was also in operation during the early part of 1946. Mining during the latter part of 1946 consisted of operations in the Coosa Coal Company mine no. 7 (locality 4, pl. 10) in the Hammond bed, and stripping in the Coal City, Broken Arrow, and Marion beds in sec. 6, T. 16 S., R. 4 E., by R. H. Blanton to recover the rib of coal left between the old underground workings and the outcrops of the beds.

Clay

Plastic clay is associated with some of the coal beds but the deposits generally are lenticular. One of the most persistent of these bodies, however, occurs beneath the Fairview coal bed where thicknesses ranging from 5½ to 15 feet were noted. Clay approaching fire clay in quality occurs most frequently near the Bibby and Brown coal beds and is typically exposed in the railroad cut a quarter mile southwest of Pope Chapel. A bed of clay resembling the flint clay of Pennsylvania was found within the Bibby zone of coal beds in drill hole no. 3 between the depths of 339 and 341 feet, and between the Bibby and Brown coals in drill hole no. 21 at depths of 614 feet 6 inches to 622 feet.

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[54]Nesbitt, C. H., Ann. rept. of coal mines, State of Alabama, p. 25, 1915.

[55]47th Ann. Rept. State Mining Dept. of Alabama, p. 70, 1938.

[56]Broadway, Frank R., Ann. statistical rept., fiscal year 1943 to 1944; Div. of Safety and Inspection, Dept. of Industrial Relations, Alabama: p. 96.

APPENDIX

Logs of diamond drill holes bored by the Bureau of Mines, United States Department of the Interior, in the Coosa coal field, St. Clair County, Alabama.

Locations are approximate; altitude determinations are barometric; datum is sea level. Recovery of cores in coal is complete unless otherwise noted.

Log of core drill hole no. 1-1-CA

Location: 2,170 feet north and 100 feet east of the southwest corner of sec. 1, T. 16 S., R. 3 E.
Altitude: 565 feet.

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
0	0	14	0	Soil and weathered rock	14	0	
14	0	19	0	Dark silty sandstone; gypsum veins	5	0	
19	0	48	0	Medium-grained sandstone	29	0	
48	0	48	8	Carbonaceous clay; streaks of coal	0	8	
48	8	54	0	Soft plastic clay	5	4	
54	0	58	6	Shaly siltstone; streaks of sandstone	4	6	
58	6	65	9	Fine-grained sandstone	7	3	
65	9	87	0	Siltstone with streaks of sandstone and veins of calcite in the upper part	21	3	
87	0	100	8	Siltstone	13	8	
100	8	110	0	Sandstone with silty streaks	9	4	
110	0	131	0	Siltstone with fine streaks of sandstone	21	0	
131	0	134	0	Fine-grained sandstone	3	0	
134	0	155	0	Siltstone with streaks of sandstone	21	0	
155	0	179	0	Silty shale	24	0	
179	0	179	6	Clay shale with streaks of coal and abundant plant fossils	0	6	
179	6	180	0	Silty shale with plant fossils	0	6	
180	0	180	2	Dark carbonaceous claystone	0	2	
180	2	180	6	Coal	0	4	
180	6	181	7	Slickensided carbonaceous claystone	1	1	
181	7	181	9	Bone coal	0	2	Marion coal bed (faulted)
181	9	181	10	Claystone and bone coal	0	1	
181	10	182	1	Dark carbonaceous claystone	0	3	
182	1	182	3	Coal	0	2	
181	10	182	1	Dark carbonaceous claystone	0	1	
182	4	182	6	Bone coal	0	2	
182	6	183	6	Dark carbonaceous claystone	1	0	
183	6	184	6	Sandstone	1	0	
184	6	184	9	Sandy clay	0	3	
184	9	227	6	Fine- to medium-grained sandstone	42	9	
227	6	238	4	Sandstone with clay pellets in upper part	10	10	
238	4	241	6	Clay shale with fine streaks of coal	3	2	
241	6	264	3	Fossiliferous siltstone, slightly shaly	22	9	
264	3	265	5	Silty shale with streaks of coal	1	2	
265	5	265	7	Coal	0	2	Marion coal bed (faulted)
265	7	266	5	Shaly siltstone	0	10	
266	5	266	7	Coal	0	2	
266	7	267	0	Bony shale	0	5	
267	0	289	7	Medium-grained sandstone	22	7	
289	7	310	3	Siltstone, shaly in lower part	20	8	
310	3	311	3	Carbonaceous claystone	1	0	
311	3	336	0	Siltstone	24	9	
336	0	342	9	Sandstone and siltstone	6	9	
342	9	355	0	Siltstone with streaks of sandstone	12	3	
355	0	366	0	Dark fine-grained quartzitic sandstone, silty in the lower part	11	0	
366	0	400	0	Siltstone and sandstone	34	0	
400	0	434	8	Siltstone	34	8	

Log of core drill hole no. 1-1-CA (continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
434	8	437	2	Silty sandstone	2	6	
437	2	439	9	Siltstone	2	7	
439	9	441	8	Clay with carbonaceous streaks	1	11	
441	8	464	10	Siltstone and sandy siltstone	23	2	
464	10	466	4	Clayey siltstone	1	6	
466	4	467	2	Coal (no core recovered)	0	10	
467	2	469	8	Silty clay	2	6	
469	8	477	10	Silty shale	8	2	
477	10	479	0	Clayey coal } 12" core recovered	1	2	
479	0	479	2	Bone }	0	2	
479	2	479	6	Coal (no core recovered)	0	4	Bibby zone of coal beds
479	6	482	0	Silty clay	2	6	
482	0	488	0	Clayey siltstone	6	0	
488	0	497	9	Fine-grained sandstone with streaks of siltstone	9	9	
497	9	498	7	Silty clay	0	10	
498	7	498	9	Coal	0	2	
498	9	501	10	Clay with pyrite	3	1	
501	10	504	4	Claystone	2	6	
504	4	509	0	Mudstone	4	8	
509	0	511	6	Siltstone	2	6	
511	6	514	11	Silty shale	3	5	
514	11	517	4	Silty clay	2	5	
517	4	525	6	Silty claystone	8	2	
525	6	545	10	Quartzitic sandstone	20	4	
545	10	547	10	Siltstone and fragmental shale conglomerate	2	0	
547	10	570	0	Medium-grained sandstone	22	2	
570	0	572	0	Shale with glazed bedding planes, dip 12"	2	0	
572	0	586	3	Medium-grained sandstone	14	3	
586	3	587	4	Siltstone	1	1	
587	4	591	4	Silty clay	4	0	
591	4	594	4	Medium-grained sandstone	3	0	
594	4	594	9	Fragmental shale conglomerate	0	5	
594	9	612	6	Fine-grained sandstone	17	9	
612	6	618	6	Silty shale with streaks of sandstone	6	0	
618	6	625	6	Silty shale	7	0	
625	6	629	0	Silty clay with pyrite	3	6	
629	0	633	0	Shale and clay shale	4	0	
633	0	646	4	Fine-grained cross-bedded sandstone with streaks of shale	13	4	
646	4	667	0	Fine-grained sandstone	20	8	
667	0	848	8	Clayey siltstone, weathers to reddish brown in patches and bands	181	8	
848	8	853	0	Silty claystone which breaks along fracture planes at 45°. Some fracture planes slickensided, others rough; a few siltstone streaks in the upper part parallel the fracture planes	4	4	
853	0	863	0	Silty claystone somewhat shaly with streaks of siltstone	10	0	
863	0	874	0	Very course-grained siltstone; upper part thin-bedded and contorted	11	0	

Log of core drill hole no. 2-11-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
197	8	199	8	Siltstone	2	0	
199	8	206	4	Fine-grained sandstone	6	8	
206	4	209	4	Claystone and siltstone	3	0	
209	4	223	0	Shaly claystone	13	8	
223	0	233	0	Soft dark-brown to black claystone, contains streaks of coal and many slickensided surfaces	10	0	
233	0	233	9	Coal and bone with thin veins of pyrite	0	9	
233	9	235	0	Clayey siltstone	1	3	
235	0	237	9	Sandstone with streaks and fragments of coal	2	9	
237	9	246	0	Siltstone	8	3	
246	0	279	0	Medium-grained sandstone, with fragments of coal and rounded claystone	33	0	
279	0	280	0	Siltstone	1	0	
280	0	308	0	Sandstone	28	0	
308	0	316	0	Sandstone, streaks of claystone in upper part and bands of siltstone in lower part	8	0	
316	0	326	5	Shaly black claystone with narrow streaks of siltstone in upper part	10	5	
326	5	327	0	Claystone	0	7	
327	0	328	0	Coal (9" core recovered)	1	0	) Brown coal bed
328	0	328	4	Clay	0	4	
328	4	332	0	Siltstone with sandy streaks in lower part	3	8	
332	4	334	4	Sandstone	2	4	
334	4	337	0	Siltstone with sandy streak in lower part	2	8	
337	0	342	2	Sandstone with scattered coaly streaks	5	2	
342	2	355	0	Siltstone with sandy streaks	12	10	
355	0	371	6	Shaly and black claystone	16	6	
371	6	374	0	Claystone with sandy streaks	2	6	
374	0	381	0	Shaly claystone with occasional brown bands	7	0	
381	0	385	6	Sandstone	4	6	
385	6	392	0	Shaly black claystone with sandy streaks and pellets	6	6	
392	0	399	0	Black claystone with hard brown bands	7	0	
399	0	411	0	Siltstone with many sandy streaks	12	0	
411	0	418	0	Sandstone and siltstone in thin alternating layers	7	0	
418	0	428	0	Black siltstone, with many plant fossils	10	0	
428	0	441	6	Sandstone	13	6	
441	6	443	0	Shaly siltstone	1	6	
443	0	444	6	Sandstone	1	6	
444	6	456	0	Shaly siltstone with thin streaks of sandstone	11	6	
456	0	519	0	Shaly black siltstone	63	0	
519	0	531	0	Black siltstone with lenses and bands of sand	12	0	

Log of core drill hole no. 2-11-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
531	0	543	0	Silty black claystone	12	0	
543	0	570	0	Black silty shaly claystone, with thin streaks and lenses of sand, chiefly in the upper part	27	0	
570	0	570	9	Coal (4" core recovered)	0	9	Gann coal bed
570	9	571	0	Siltstone with many plant fossils	0	3	
571	0	574	0	Thin-bedded sandstone	3	0	
574	0	579	0	Thin-bedded sandstone with parting of coaly shale	5	0	
579	0	588	9	Black silty shale and sandstone in alternating thin bands	9	9	
588	9	590	0	Coal	1	3	Higginbotham coal bed
590	0	590	6	Coaly claystone	0	6	
590	6	596	8	Sandstone	6	2	
596	8	598	4	No core recovered	1	8	
598	4	611	0	Sandstone with plant fossils in lower 3 ft.	12	8	
611	0	612	0	Medium-grained sandstone with rounded claystone fragments	1	0	
612	0	640	0	Sandstone with occasional coaly streaks	28	0	
640	0	643	0	Siltstone	3	0	
643	0	644	0	Sandstone with many plant fossils and siltstone fragments	1	0	
644	0	656	6	Sandstone, thin-bedded in the upper part. Bottom 6" is claystone conglomerate	12	6	
656	6	660	0	Black claystone	3	6	
660	0	661	3	Coal (12" core recovered)	1	3	Fairview coal bed
661	3	663	7	Claystone	2	4	
663	7	665	5	Coal	1	10	
665	5	669	0	Black slickensided clay	3	7	
669	0	673	0	Sandstone	4	0	
673	0	681	6	Siltstone; bottom part sandy	8	6	
681	6	683	0	Silty claystone	1	6	
683	0	708	0	Sandstone with plant fossils in lower part	25	0	
708	0	736	0	Shaly claystone in thin beds alternating with thin sandstone partings	28	0	
736	0	737	6	Sandstone	1	6	
737	6	743	0	Sandstone and siltstone	5	6	
743	0	744	6	Sandstone	1	6	
744	6	749	0	Siltstone	4	6	
749	0	758	0	Sandstone with plant fossils	9	0	
758	0	760	6	Black shale	2	6	
760	6	762	0	Sandstone	1	6	
762	0	789	6	Sandstone and siltstone, mostly thin-bedded	27	6	
789	6	795	0	Sandstone	5	6	
795	0	837	0	Lenticular and thin-bedded siltstone and sandstone	42	0	
837	0	846	0	Sandstone	9	0	
846	0	851	3	Black shale	5	3	
851	3	852	0	Shaly black claystone	0	9	

Log of core drill hole no. 2-11-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
852	0	852	3	Coal	0	3	
852	3	852	7	Bone	0	4	
852	7	853	1	Coal	0	6	New coal bed
853	1	854	1	Coaly claystone	1	0	
854	1	855	0	Coal	0	11	
855	0	855	8	Claystone, streaks of coal	0	8	
855	8	857	0	Siltstone	1	4	
857	0	859	6	Silty claystone	2	6	
859	6	860	5	Coal (no core recovered)	0	11	
860	5	875	6	Siltstone with streaks of sandstone	15	1	
875	6	877	8	Sandstone	2	2	
877	8	883	2	Siltstone and sandstone	5	6	
883	2	885	2	Sandstone	2	0	
885	2	896	0	Dark-gray claystone with silty and sandy streaks and lenses	10	10	
896	0	902	6	Thin-bedded sandstone with siltstone partings	6	6	
902	6	914	0	Siltstone with streaks of sandstone	11	6	
914	0	925	6	Sandstone with siltstone partings	11	6	
925	6	939	0	Siltstone with streaks of sandstone	13	6	
939	0	944	0	Sandstone with siltstone partings	5	0	
944	0	967	0	Siltstone and sandstone in alternating thin bands and lenses	23	0	
967	0	1017	0	Siltstone with scattered sandstone partings	50	0	
1017	0	1018	2	Coal (10½" core recovered)	1	2	Upper Chapman
1018	2	1018	5½	Core lost, reported to be coal	0	3½	coal bed
1018	5½	1019	0	Claystone with ¼" streak of coal and many plant remains	0	6½	
1019	0	1025	2	Black siltstone; many plant fossils	6	2	
1025	2	1039	0	Thin sandstone and siltstone in alternating beds	13	10	
1039	0	1075	0	Sandstone with a few silty streaks	36	0	

Total depth 1,075 feet.

Log of core drill hole no. 3-1-CA

Location: 2,500 feet south and 1,920 feet east of the northwest corner of sec. 1, T. 16 S., R. 3 E.

Altitude: 530 feet.

0	0	9	6	Soil and weathered rock	9	6
9	6	10	0	Sandstone	0	6
10	0	14	0	Clay	4	0
14	0	14	6	Clay with ferruginous concretions	0	6
14	6	17	0	Black clay; many fossil plants	2	6
17	0	18	8	Carbonaceous claystone with thin streaks of bone and coal	1	8
18	8	18	9	Bone coal	0	1
18	9	20	2	Carbonaceous clay with thin streak of bone	1	5
20	2	20	3	Bone coal	0	1
20	3	21	3	Carbonaceous claystone with thin streak of bone	1	0
21	3	21	5	Coal	0	2

Log of core drill hole no. 3-1-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
21	5	21	7	Clay and bone coal	0	2	
21	7	23	10	Carbonaceous claystone with streaks of bone coal	2	3	
23	10	24	0	Coal	0	2	
24	0	30	0	Clay	6	0	
30	0	32	0	Siltstone	2	0	
32	0	55	6	Fine- to medium-grained sandstone with carbonaceous streaks at 39'6" to 40'0"; contains small percentage of feldspar and muscovite; dip 20°	23	6	
55	6	66	6	Siltstone with very few sandy streaks; dip 30°	11	0	
66	6	70	0	Siltstone with minor sandy streaks; plant fossils near base	3	6	
70	0	70	3	Carbonaceous claystone	0	3	
70	3	71	7	Coal	1	4	} Marion
71	7	72	1	Impure coal	0	6	} coal bed
72	1	73	0	Carbonaceous claystone	0	11	
73	0	73	8	Bone coal	0	8	
73	8	82	4	Claystone with many fossil plants	8	8	
82	4	83	4	Claystone	1	0	
83	4	85	4	Silty claystone	2	0	
85	4	100	0	Fine-grained thin-bedded sandstone	14	8	
100	0	116	8	Medium-grained thick-bedded biotitic sandstone	16	8	
116	8	126	0	Coaly shale	9	4	
126	0	130	0	Claystone	4	0	
130	0	134	0	Thin-bedded siltstone in alternating gray, brown and white bands; dip 20-25°	4	0	
134	0	146	0	Thin-bedded sandstone with silty partings	12	0	
146	0	148	0	Thin-bedded siltstone and sandstone	2	0	
148	0	172	0	Claystone with occasional concretionary bands	24	0	
172	0	180	0	Sandstone	8	0	
180	0	191	0	Shale with sandy partings; dip 25°	11	0	
191	0	195	6	Dark-gray shale	4	6	
195	6	196	0	Sandy shale	1	0	
196	6	204	6	Dark-gray shale with silty partings	8	0	
204	6	206	6	Fine-grained sandstone	2	0	
206	6	217	0	Shaly siltstone with sandy partings	10	6	
217	0	219	0	Sandstone	2	0	
219	0	237	0	Shaly siltstone with ferruginous concretions and white sandy partings	18	0	
237	0	252	0	Shaly black claystone	15	0	
252	0	253	0	Gray shale	1	0	
253	0	254	0	Clayey coal	1	0	) Bibby coal bed
254	0	255	6	Coaly clay	1	6	
255	6	261	6	Dark-gray claystone with hackly fracture	6	0	
261	6	265	0	Shaly siltstone; dip 20°	3	6	
265	0	280	0	Sandstone	15	0	
280	0	290	0	Sandstone with pellets of clay and pieces of carbonized plants	10	0	

Log of core drill hole no. 3-1-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.
290	0	311	0	Sandstone with two 8" beds of black shale, and occasional pellets of shale and pieces of carbonized plants	21	0
311	0	313	6	Black shale	2	6
313	6	328	0	Coaly slickensided shale	14	6
328	0	336	6	Shaly claystone	8	6
336	6	339	0	Coaly slickensided claystone	2	6
339	0	341	0	Silty and shaly clay and brown (flint clay) claystone	2	0
341	0	343	0	Claystone with many plant fossils	2	0
343	0	353	0	Shaly claystone	10	0
353	0	378	0	Sandstone; carbonized plants at 371'-375'	25	0
378	0	400	0	Claystone	22	0
400	0	408	0	Siltstone	8	0
408	0	439	0	Sandstone; dip 30°	31	0
439	0	444	0	Shaly claystone and siltstone	5	0
444	0	457	0	Siltstone	13	0
457	0	459	0	Sandstone	2	0
459	0	461	0	Siltstone	2	0
461	0	464	0	Shaly claystone	3	0
464	0	475	0	Shaly siltstone and claystone with ferruginous concretions; dip 20°	11	6
475	6	498	6	Sandstone; upper 8" silty	23	0
498	6	504	0	Silty and shaly claystone	5	6
504	0	523	0	Siltstone with shale partings and sandy lenses making alternating bands as thick as ¼"; dip 20°	19	0
523	0	532	0	Claystone	9	0
532	0	537	0	Siltstone	5	0
537	0	538	6	Black claystone	1	6
538	6	538	8	Carbonaceous clay	0	2
538	8	539	0	Coal	0	4
539	0	541	2	Claystone	2	2
541	2	547	0	Siltstone	5	10
547	0	549	6	Claystone	2	6
549	6	554	0	Siltstone	4	6
554	0	558	0	Claystone	4	0
558	0	559	1	Coal (8" core recovered)	1	1
559	1	579	0	Alternating light- and dark-gray bands of siltstone, about ½" thick	19	11
579	0	580	4	Coal (no core recovered)	1	4
580	4	605	0	Light- and dark-gray bands of siltstone of varying thickness	24	8
605	0	607	11	Thin-bedded sandstone	2	11
607	11	608	7	Coal (no core recovered)	0	8
608	7	609	2	Claystone	0	7
609	2	610	1	Dirty coal (no core recovered)	0	11
610	1	612	9	Coaly and slickensided clay	2	8
612	9	615	0	Sandstone and siltstone	2	3
615	0	623	0	Claystone	8	0
623	0	630	6	Siltstone and claystone	7	6
630	6	632	6	Sandstone	2	0
632	6	634	0	Shale	1	6

Log of core drill hole no. 3-1-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
634	0	637	0	Sandy siltstone	3	0	
637	0	638	0	Shale	1	0	
638	0	643	0	Clay, slickensided in the upper part	5	0	
643	0	649	0	Claystone	6	0	
649	0	653	0	Siltstone	4	0	
653	0	735	6	Thick-bedded, dark-gray, medium-grained sandstone, with many carbonized plants at 673′-678′	82	6	
735	6	748	6	Siltstone with thin sandy streaks and lenses and brownish bands	13	0	
748	6	754	0	Black slickensided claystone	5	6	
754	0	758	0	Siltstone grading into sandstone	4	0	
758	0	764	0	Sandstone	6	0	
764	0	810	0	Shaly black siltstone and claystone	46	0	
810	0	839	0	Shaly black siltstone and claystone with scattered thin streaks of sandstone	29	0	
839	0	842	6	Sandstone	3	6	
842	6	857	1	Sandstone with ferruginous and claystone fragments and plant fossils	14	7	
857	1	858	4	Very carbonaceous claystone	1	3	
858	4	859	0	Coal (6″ core recovered)	0	8	Fairview coal bed
859	0	859	7	Coaly clay	0	7	
859	7	860	1	Coal	0	6	
860	1	860	2	Carbonaceous clay	0	1	
860	2	860	3	Coal	0	1	
860	3	860	8	Carbonaceous and slickensided clay	0	5	
860	8	860	10	Coal	0	2	
860	10	861	1	Coaly clay	0	3	
861	1	861	7	Coal (4″ core recovered)	0	6	
861	7	861	9	Broken coal (no core recovered)	0	2	
861	9	864	0	Carbonaceous claystone	2	3	
864	0	868	0	Thin-bedded siltstone and claystone	4	0	
868	0	882	0	Thin-bedded sandstone and siltstone	14	0	
882	0	886	6	Sandstone	4	6	
886	6	889	0	Siltstone	2	6	
889	0	910	0	Sandstone with carbonaceous streaks at 898′ to 904′ and silty streaks in lower parts; dip 90° at 900′; 7° at 910′	21	0	
910	0	922	4	Sandstone	12	4	
922	4	942	0	Claystone with scattered silty partings; many slickensided surfaces; dip 10°	19	8	
942	0	954	0	Shaly claystone with scattered sandy partings	12	0	
954	0	999	6	Sandstone with scattered siltstone partings in upper part	45	6	
999	6	1003	6	Fragments of coaly silty material, greatly contorted (4″ core recovered)	4	0	
1003	6	1004	0	Fractured and contorted siltstone with sandy partings	0	6	

Log of core drill hole no. 4-14-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
				partings	13	0	
443	0	452	0	Sandstone with siltstone near the base	9	0	
452	0	454	4	Sandstone with coaly streaks	2	4	
454	4	455	3	Coal (10" core recovered)	0	11	
455	3	460	9	Slickensided claystone; plant fossils	5	6	
460	9	461	5	Coal (5" core recovered)	0	8	Fairview coal bed
461	5	466	5	Silty claystone	5	0	
466	5	466	7	Coal	0	2	
466	7	470	10	Claystone with coaly streaks	4	3	
470	10	474	10	Silty claystone	4	0	
474	10	477	10	Siltstone with sandy partings	3	0	
477	10	489	0	Sandstone with silty partings	11	2	
489	0	495	0	Sandstone	6	0	
495	0	524	0	Sandstone with occasional silty partings and clay pellets	29	0	
524	0	526	0	Siltstone and sandstone	2	0	
526	0	560	0	Shale with occasional streaks of sand	34	0	
560	0	561	0	Sandstone	1	0	
561	0	565	0	Silty shale with occasional streaks of sand and ferruginous concretions	4	0	
565	0	579	0	Silty carbonaceous claystone; bottom 6 inches are shaly and contain many ferruginous concretions	14	0	
579	0	579	10	Coal (6" core recovered)	0	10	New coal bed
579	10	580	4	Carbonaceous slickensided clay	0	6	
580	4	584	0	Siltstone and sandstone	3	8	
584	0	587	0	Siltstone with numerous plant remains	3	0	
587	0	587	10	Carbonaceous and slickensided claystone	0	10	
587	10	592	4	Siltstone with thin lenticular sand partings	4	6	
592	4	594	4	Sandstone	2	0	
594	4	598	4	Siltstone	4	0	
598	4	660	0	Shale and siltstone with occasional small sandy lenses and partings which become more numerous in the lower 10 inches	61	8	
660	0	691	0	Silty dark-gray to black shale	31	0	
691	0	719	0	Thin-bedded siltstone and shale	28	0	
719	0	736	0	Sandstone with siltstone partings; thin-bedded in the lower part	17	0	
736	0	744	0	Shale with sandy partings	8	0	
744	0	756	0	Sandstone with shale partings which predominate in the lower 8'	12	0	
756	0	760	0	Lenticular and cross-bedded siltstone and sandstone	4	0	
760	0	775	6	Shale with scattered sandy lenses in the lower 4 inches	15	6	
775	6	821	0	Lenticular siltstone and sandstone	45	6	
821	0	826	0	Shaly claystone with sandy streaks	5	0	
826	0	833	6	Sandstone with shaly partings	7	6	
833	6	957	0	Shale with scattered sandy streaks	123	6	

Log of core drill hole no. 4-14-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.
957	0	977	0	Thin-bedded siltstone and sandstone; predominantly silty at the top and sandy and cross-bedded at the bottom	20	0
977	0	1006	0	Sandstone with occasional shale partings as much as 3″ thick	29	0
1006	0	1012	0	Silicinate sandstone	6	0
1012	0	1015	0	Thin-bedded siltstone and sandstone	3	0
1015	0	1021	0	Sandstone with silty partings	6	0
1021	0	1024	0	Sandstone with many coal streaks	3	0
1024	0	1032	0	Sandstone with scattered coal streaks	8	0
1032	0	1036	6	Siltstone with scattered sand lenses	4	6
1036	6	1039	6	Sandstone with scattered pellets and partings of siltstone	3	0
1039	6	1044	0	Sandy siltstone	4	6
1044	0	1046	6	Sandstone	2	6
1046	6	1051	0	Siltstone and sandstone	4	6
1051	0	1075	6	Sandstone with streaks of coal at 1,059′	24	6
1075	6	1081	6	Sandy siltstone	6	0
1081	6	1114	6	Lenticular and shaly sandstone and siltstone	33	0
1114	6	1117	0	Sandstone; coaly at base	2	6
1117	0	1123	0	Thin-bedded siltstone and sandstone	6	0
1123	0	1175	0	Sandstone with scattered bands of siltstone and streaks of coal, 1,142′ to 1,143′	52	0
				Total depth 1,175 feet.		

Log of core drill hole no. 5-15-CA

Location: 900 feet north and 2,020 feet west of the southeast corner of sec. 15, T. 16 S., R. 3 E.

Altitude: 605 feet.

0	0	24	0	Soil and weathered rock	24	0
24	0	30	0	Medium-grained sandstone with feldspar and some biotite in bottom 2 inches	6	0
30	0	40	0	No core recovered	10	0
40	0	41	0	Sandstone	1	0
41	0	44	0	Siltstone with sandy streaks	3	0
44	0	50	0	Sandstone with siltstone partings	6	0
50	0	50	5	Claystone with streaks of coal	0	5
50	5	50	9	Siltstone	0	4
50	9	50	11	Claystone with streaks of coal	0	2
50	11	52	0	Sandstone	1	1
52	0	75	0	Silty shale with streaks of sandstone (2″ of coal at 67′)	23	0
75	0	79	0	Carbonaceous claystone	4	0
79	0	80	6	Siltstone	1	6
80	6	102	6	Shale with sandy partings and scattered ferruginous concretions	22	0

Log of core drill hole no. 6-30-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
132	5	132	8	Claystone	0	3	
132	8	133	9	Coal (11" core recovered)	1	1	Higginbotham coal bed
133	9	134	5	Coal and bone (5" core recovered)	0	8	Higginbotham coal bed
134	5	135	6	Carbonaceous clay	1	1	
135	6	137	0	Slickensided claystone	1	6	
137	0	173	8	Cross-bedded sandstone	36	8	
173	8	190	8	Shaly siltstone	17	0	
190	8	194	6	Sandy siltstone	3	10	
194	6	204	0	Sandstone with silty carbonaceous partings and fragments of ferruginous concretions	9	6	
204	0	208	5	Siltstone (12" core recovered)	4	5	
208	5	209	4	Coal	0	11	Fairview coal bed
209	4	209	8	Clayey coal	0	4	Fairview coal bed
209	8	209	11	Bone	0	3	Fairview coal bed
209	11	210	3	Clayey coal (19" core recovered)	0	4	Fairview coal bed
210	3	211	7	Coal (19" core recovered)	1	4	Fairview coal bed
211	7	212	6	Coaly claystone	0	11	
212	6	212	10	Carbonaceous slickensided claystone	0	4	
212	10	229	0	Carbonaceous claystone, shaly in lower part	16	2	
229	0	238	0	Shaly siltstone with sandy streaks	9	0	
238	0	244	4	Sandstone with silty partings; dip 20°	6	4	
244	4	268	3	Shale; occasional 2" to 4" sandy beds; scattered ferruginous concretions	23	11	
268	3	270	10	Sandy siltstone	2	7	
270	10	286	6	Silty shale with sandy partings	15	8	
286	6	321	0	Sandstone with scattered silty streaks	34	6	
321	0	323	6	Siltstone and sandstone	2	6	
323	6	343	6	Sandstone with scattered silty partings	20	0	
343	6	347	0	Shaly claystone	3	6	
347	0	349	0	Sandstone	2	0	
349	0	353	0	Siltstone and sandstone	4	0	
353	0	369	0	Sandstone with silty partings at base	16	0	
369	0	383	9	Shaly claystone with scattered sandy streaks and ferruginous concretions	14	9	
383	9	383	10	Clay and coal	0	1	New coal bed
383	10	384	10	Coal (7" core recovered)	1	0	New coal bed
384	10	385	5	Coaly slickensided claystone	0	7	New coal bed
385	5	394	0	Shaly claystone; many plant fossils; and scattered pyrite	8	7	
394	0	418	0	Shaly siltstone with sandy partings; dip 20°	24	0	
418	0	432	0	Shaly claystone with occasional sandy streaks at base	14	0	
432	0	435	0	Sandstone with silty partings	3	0	
435	0	441	6	Sandy siltstone	6	6	
441	6	444	0	Sandstone	2	6	
444	0	462	6	Lenticular thin-bedded siltstone and sandstone	8	6	

Log of core drill hole no. 6-30-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
462	6	471	0	Shaly claystone	8	6	
471	0	478	0	Siltstone with sandy lenticular partings	7	0	
478	0	503	0	Shaly and silty claystone; slickensided 488′ to 491′; ferruginous concretions at base	25	0	
503	0	513	0	Shale and thin-bedded sandstone	10	0	
513	0	519	0	Sandstone	6	0	
519	0	529	0	Shale and thin-beded sandstone	10	0	
529	0	534	0	Shaly claystone with ferruginous concretions	5	0	
534	0	543	6	Siltstone and claystone with sandy partings and ferruginous concretions	9	6	
543	6	549	0	Thin-bedded sandstone and shale	5	6	
549	0	557	0	Sandstone with shale partings	8	0	
557	0	569	5	Shaly claystone with sandy partings and scattered ferruginous concretions	12	5	
569	5	569	8	Carbonaceous claystone	0	3	
569	8	569	9	Coal and clay	0	1	Upper Chapman coal bed
569	9	570	6	Coal (6″ core recovered)	0	9	
570	6	570	9	Claystone with streaks of coal	0	3	
570	9	573	3	Claystone with many plant fossils	2	6	
573	3	584	0	Shaly claystone; streak of coal at 582 feet	10	9	
584	0	588	0	Siltstone; sandy at base	4	0	
588	0	590	0	Sandstone, silicinate	2	0	
				Total depth 590 feet.			

Log of core drill hole no. 7-31-CA

Location: 1,420 feet south and 1,100 feet east of the northwest corner of sec. 31, T. 15 S., R. 4 E.
Altitude: 570 feet.

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
0	0	15	6	Soil and weathered rock	15	6	
15	6	32	0	Silty shaly carbonaceous claystone; scattered ferruginous concretions	16	6	
32	0	53	6	Thin-bedded siltstone and sandstone; dip 15°	21	6	
53	6	124	0	Shaly claystone with occasional sandy zones	70	6	
124	0	156	0	Thin-bedded sandstone and shale with ferruginous concretions	32	0	
156	0	157	6	Sandstone with silty partings	1	6	
157	6	159	0	Shaly siltstone	1	6	
159	0	161	3	Lenticular sandstone with shaly partings	2	3	
161	3	164	3	Clayey and shaly siltstone; many plant fossils	3	0	
164	3	164	6	Shale with thin streaks of coal	0	3	
164	6	165	9	Coal (13″ core recovered)	1	3	Gann coal bed

Log of core drill hole no. 7-31-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
165	9	166	0	Shale with thin streaks of coal	0	3	
166	0	166	6	Carbonaceous siltstone	0	6	
166	6	180	10	Siltstone with shaly partings and occasional sandy beds	14	4	
180	10	181	0	Shaly claystone	0	2	
181	0	181	9	Coal; clay streaks at base (8″ core recovered)	0	9	
181	9	182	5	Coaly clay	0	8	Higginbotham coal bed
182	5	182	7	Bone	0	2	
182	7	183	5	Carbonaceous clay	0	10	
183	5	186	0	Carbonaceous slickensided claystone	0	7	
186	0	194	0	Shaly claystone with many plant fossils	8	0	
194	0	199	6	Sandstone	5	6	
199	6	200	0	Carbonaceous claystone	0	6	
200	0	225	0	Sandstone with occasional coaly streaks; clay pellets at the base	25	0	
225	0	227	0	Shaly carbonaceous claystone	2	0	
227	0	238	9	Sandstone with coaly streaks and clay pellets at the top	11	9	
238	9	247	6	Shale	8	9	
247	6	248	10	Coal (8″ core recovered)	1	4	
248	10	249	0	Coal and clay	0	2	Fairview coal bed
249	0	249	2½	Clay with coal streaks	0	2½	
249	2½	250	3	Coal (2″ core recovered)	1	0½	
250	3	250	5½	Coaly clay	0	2½	
250	5½	251	4	Clay with streaks of coal (3″ core recovered)	0	10½	
251	4	254	4	Carbonaceous claystone	3	0	
254	4	262	0	Claystone with streaks of coal	7	8	
262	0	268	0	Shaly thin-bedded sandstone and siltstone	6	0	
268	0	305	0	Sandstone with occasional thin silty beds	37	0	
305	0	323	6	Shaly siltstone with sandy partings	18	6	
323	6	334	6	Sandstone	11	0	
334	6	350	0	Siltstone with many sandy partings	15	6	
350	0	352	6	Sandstone	2	6	
352	6	355	0	Siltstone and sandstone	2	6	
355	0	369	0	Sandstone; silty zones	14	0	
369	0	382	0	Shaly siltstone	13	0	
382	0	385	0	Siltstone and sandstone	3	0	
385	0	390	6	Sandstone with occasional silty partings	5	6	
390	6	392	6	Siltstone	2	0	
392	6	394	6	Sandstone	2	0	
394	6	432	6	Shaly and silty claystone with ferruginous concretions	38	0	
432	6	438	6	Sandstone	6	0	
438	6	456	6	Shaly claystone with silty partings and scattered sandy lenses	18	0	
456	6	481	6	Thin-bedded sandstone with silty partings and occasional sandy zones	25	0	

Log of core drill hole no. 7-31-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
481	6	503	0	Shaly and silty claystone with lenticular sandy partings	21	6	
503	0	508	0	Sandstone and siltstone	5	0	
508	0	526	0	Shaly thin-bedded siltstone with sandy partings	18	6	
526	6	529	6	Shaly claystone	3	0	
529	6	530	6	Sandstone	1	0	
530	6	546	0	Shaly claystone with sandy partings	15	6	
546	0	548	6	Sandstone and siltstone	2	6	
548	6	551	6	Shaly claystone with sandy partings	3	0	
551	6	553	0	Sandstone and siltstone	1	6	
553	0	567	0	Shaly claystone with sandy partings	14	0	
567	0	577	9½	Shaly claystone with many plant fossils	10	9½	
577	9½	578	0	Claystone	0	2½	
578	0	578	5	Coal	0	5	Upper Chapman coal bed
578	5	578	11	Claystone with streaks of coal	0	6	
578	11	583	3	Clayey siltstone	4	4	
583	3	590	3	Shaly siltstone with sandy partings	7	0	
590	3	608	0	Fine-grained silicinate sandstone with scattered silty zones	17	9	
				Total depth 608 feet.			

Log of core drill hole no. 8-31-CA

Location: 50 feet north and 200 feet west of the southeast corner of the NE¼ sec. 31, T. 15 S., R. 4 E.
Altitude: 665 feet.

0	0	19	0	Weathered rock	19	0	
19	0	42	0	Sandstone	23	0	
42	0	48	0	Shaly claystone	6	0	
48	0	52	6	Silty and shaly claystone	4	6	
52	6	67	6	Siltstone with sandy partings	15	0	
67	6	71	0	Medium-grained sandstone	3	6	
71	0	87	0	Sandstone with silty partings	16	0	
87	0	110	3	Carbonaceous shale with scattered ferruginous concretions and coal streaks 105′ to 106′ 6″; slickensides in the lower part	23	3	
110	3	110	9	Coal (no core recovered)	0	6	Broken Arrow coal bed
110	9	110	11	Carbonaceous shale	0	2	
110	11	111	6½	Coal (no core recovered)	0	7½	
111	6½	112	9	Shale with streaks of coal	1	2½	
112	9	112	11½	Coal (1½″ core recovered)	0	2½	
112	11½	113	10	Thin-bedded coal and carbonaceous shale (7″ core recovered)	0	10½	
113	10	114	10½	Shale with streaks of coal (8″ core recovered)	1	0½	
114	10½	115	4	Coal (no core recovered)	0	5½	
115	4	115	8	Shale (2″ core recovered)	0	4	
115	8	115	11½	Siltstone	0	3½	
115	11½	120	0	Sandstone	4	0½	

Log of core drill hole no. 8-31-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
120	0	121	6	Carbonaceous shale, sandy in the lower part	1	6	
121	6	153	0	Sandstone; shale parting at 138′ 6″	31	6	
153	0	157	6	Shaly claystone	4	6	
157	6	161	6	Sandy siltstone	4	0	
161	6	169	6	Shale; streaks of coal from 168′ to 169′ 6″	8	0	
169	6	169	10	Coal (2″ core recovered)	0	4	
169	10	170	6	Claystone with streaks of coal	0	8	
170	6	179	0	Sandy siltstone	8	6	
179	0	191	0	Silty sandstone; streaks of coal 186′ to 188′	12	0	
191	0	194	3	Siltstone	3	3	
194	3	201	10	Shaly claystone; streaks of coal in the bottom 2′	7	7	
201	10	202	3	Clay and coal; streaks of pyrite	0	5	Marion coal bed
202	3	202	11	Coal with streaks of clay	0	8	Marion coal bed
202	11	203	8	Coal (8″ core recovered)	0	9	Marion coal bed
203	8	204	1	Claystone with streaks of coal	0	5	Marion coal bed
204	1	208	2	Claystone	4	1	
208	2	209	2	Sandstone	1	0	
209	2	214	3	Claystone; slickensides and streaks of coal in the lower 18 inches	5	1	
214	3	224	0	Sandstone	9	9	
224	0	230	7	Shaly and clayey siltstone	6	7	
230	7	236	6	Claystone, coaly streaks and scattered ferruginous concretions	5	11	
236	6	238	0	Claystone	1	6	
238	0	243	0	Shaly claystone; streak of coal at top and at 240′ 6″	5	0	
243	0	250	0	Shaly siltstone	7	0	
250	0	256	0	Claystone, wormhole casts	6	6	
256	6	264	6	Silty claystone	8	0	
264	6	268	0	Thin-bedded sandstone and siltstone	3	6	
268	0	317	0	Siltstone with occasional sandy or shaly zones	49	0	
317	0	319	6	Sandstone	2	6	
319	6	323	0	Siltstone	3	6	
323	0	328	0	Sandstone	5	0	
328	0	330	6	Shaly claystone with many plant fossils	2	6	
330	6	333	0	Sandy siltstone	2	6	
333	0	337	0	Sandstone	4	0	
337	0	348	0	Thin-bedded siltstone and sandstone	11	0	
348	0	358	0	Silty and shaly claystone	10	0	
358	0	364	2	Siltstone	6	2	
364	2	364	4	Coaly clay	0	2	
364	4	369	0	Claystone, many plant fossils	4	8	
369	0	376	2	Siltstone	7	2	
376	2	383	10	Carbonaceous claystone with occasional coal streaks	7	8	
383	10	384	0	Coal	0	2	
384	0	386	0	Siltstone	2	0	
386	0	396	0	Sandstone	10	0	
396	0	398	0	Claystone	2	0	

Log of core drill hole no. 8-31-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
398	0	401	0	Sandstone	3	0	
401	0	405	0	Siltstone	4	0	
405	0	408	2	Fine-grained sandstone with silty partings	3	2	
408	2	410	0	Siltstone	1	10	
410	0	413	1	Shaly claystone with occasional streaks of coal	3	1	
413	1	413	4	Coal	0	3	Bibby zone of coal beds
413	4	414	4	Shaly claystone with occasional streaks of coal	1	0	
414	4	429	9	Siltstone in cyclic bands ½" to 2" thick	15	5	
429	9	430	4	Claystone with thin streaks of coal	0	7	
430	4	430	8	Coal	0	4	
430	8	431	9	Slickensided claystone with streaks of coal	1	1	
431	9	431	10	Coal	0	1	
431	10	435	1	Carbonaceous claystone	3	3	
435	1	447	11	Clayey siltstone	12	10	
447	11	449	11	Shaly and silty claystone	2	0	
449	11	450	9	Sandstone with streaks of coal	0	10	
450	9	451	7	Claystone	0	10	
451	7	452	4	Claystone with streaks of coal	0	9	
452	4	456	0	Claystone	3	8	
456	0	465	6	Siltstone; sandy at base	9	6	
465	6	481	0	Shaly claystone; coal streaks at 476' 9"	15	6	
481	0	552	6	Sandstone; clay pellets at 508' and 522' 6"; coal streaks at 514'	71	6	
552	6	556	0	Slickensided claystone	3	6	
556	0	570	0	Sandstone	14	0	
570	0	586	0	Shaly claystone with scattered sandy partings and ferruginous concretions	16	0	
586	0	592	1	Slickensided claystone with streaks of coal	6	1	
592	1	592	5	Coal and clay (2" core recovered)	0	4	Brown coal bed
592	5	592	7	Siltstone	0	2	
592	7	599	1	Siltstone, sandy at base	6	6	
599	1	601	1	Slickensided claystone	2	0	
601	1	617	0	Siltstone with scattered streaks of sandstone	15	11	
617	0	675	0	Shaly claystone, sandy and silty in places	58	0	
675	0	695	0	Claystone with numerous plant fossils; streak of coal at 691' 9"	20	0	
695	0	699	0	Sandstone	4	0	
699	0	700	6	Siltstone	1	6	
700	6	714	0	Fine carbonaceous sandstone with occasional silty partings	13	6	
714	0	719	0	Siltstone	5	0	
719	0	786	0	Shaly and silty claystone	67	0	
786	0	836	7	Shaly and sandy claystone with ferruginous concretions	50	7	
836	7	836	11	Thin-bedded claystone and siltstone	0	4	

Log of core drill hole no. 8-31-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
836	11	837	0	Coal and clay	0	1	Gann coal bed
837	0	837	10½	Coal, thin streaks of clay (9½" core recovered)	0	10½	Gann coal bed
837	10½	840	0	Thin-bedded siltstone and claystone, plant fossils	2	1½	
840	0	857	4	Fine-grained thin-bedded silty sandstone with slickensided partings	17	4	
857	4	858	0	Coal (no core recovered)	0	8	Higginbotham coal bed
858	0	860	6	Shaly and silty claystone	2	6	
860	6	865	6	Claystone with many plant fossils	5	0	
865	6	873	0	Cross-bedded siltstone and sandstone	7	6	
873	0	894	10	Medium-grained sandstone with occasional silty partings	21	10	
894	10	897	2	Claystone conglomerate with sand matrix, streaks of coal and many plant fossils	2	4	
897	2	916	6	Medium-grained sandstone with streaks of coal in the top 1'; and claystone conglomerate 915' 6" to 916' 6"	19	4	
916	6	930	10	Shaly claystone (13' 9" core recovered)	14	4	
930	10	931	10	Coal (7" core recovered)	1	0	Fairview coal bed
931	10	932	10	Clay with streaks of coal (9" core recovered)	1	0	Fairview coal bed
932	10	933	0	Clay and coal	0	2	Fairview coal bed
933	0	934	0	Coal (10" core recovered)	1	2	Fairview coal bed
934	2	934	4	Clay and coal	0	2	Fairview coal bed
934	4	935	10	Slickensided claystone with streaks of coal	1	6	
935	10	943	0	Siltstone	7	2	
943	0	951	0	Thin-bedded sandstone and siltstone	8	0	
951	0	962	0	Sandstone, streaks of coal in the bottom foot	11	0	
962	0	972	0	Siltstone with scattered sandy partings	10	0	
972	0	981	0	Sandstone	9	0	
981	0	982	0	Siltstone and sandstone	1	0	
982	0	1000	0	Sandstone with scattered silty or carbonaceous streaks	18	0	
1000	0	1015	0	Shale with lenticular sandy partings ferruginous bands in the bottom 3'	15	0	
1015	0	1079	0	Thick-bedded sandstone with shale partings; shale fragments 1,054' to 1,055'	64	0	
1079	0	1082	0	Siltstone with sandy partings	3	0	
1082	0	1085	6	Claystone	3	6	
1085	6	1104	6	Thin-bedded sandstone with many shaly partings	19	0	
1104	6	1125	4	Shaly claystone	20	10	
1125	4	1125	10½	Carbonaceous clay with streaks of coal	0	6½	
1125	10½	1126	10	Coal (9" core recovered)	0	11½	New coal bed

Log of core drill hole no. 8-31-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
1126	10	1129	9	Carbonaceous claystone, streaks of coal and pyrite	2	11	
1129	9	1132	7	Claystone	2	10	
1132	7	1132	9	Coal	0	2	
1132	9	1145	0	Claystone, sandy at base	12	3	
1145	0	1154	0	Thin-bedded sandstone and shale	9	0	
1154	0	1157	6	Sandstone	3	6	
1157	6	1178	0	Shaly claystone with scattered sandy partings	20	6	
1178	0	1189	6	Thin-bedded claystone and sandstone	11	6	
1189	6	1211	0	Claystone with scattered lenticular partings	21	6	
1211	0	1235	0	Thin-bedded sandstone and claystone	24	0	
1235	0	1262	0	Shaly claystone with sandy partings in the lower part	27	0	
1262	0	1269	0	Sandstone, shaly in the upper part	7	0	
1269	0	1282	6	Shale and thin-bedded sandstone	13	6	
1282	6	1285	0	Sandstone	2	6	
1285	0	1289	5	Shaly claystone with sandy partings	4	5	
1289	5	1290	6	Coal (6½" core recovered)	1	1	} Upper Chapman coal bed
1290	6	1290	7	Coal and clay	0	1	
1290	7	1291	5	Coal (9" core recovered)	0	10	
1291	5	1298	0	Claystone	6	7	
				Total depth 1,298 feet.			

Log of core drill hole no. 9-20-CA

Location: 2,600 feet south and 2,540 feet east of the northwest corner of sec. 20, T. 15 S., R. 4 E.
Altitude: 545 feet.

0	0	6	0	Weathered rock	6	0	
6	0	12	0	Silty weathered claystone	6	0	
12	0	17	0	Siltstone and claystone	5	0	
17	0	23	6	Shaly and silty claystone; dip 15°-20°	6	6	
23	6	24	4	Coal (no core recovered))	0	10	) Gann coal bed
24	4	46	0	Thin-bedded siltstone with sandy zones; dip 20°	21	8	
46	0	46	6	Sandstone with streaks of pyrite and carbonized plant fragments	0	6	
46	6	46	10	Siltstone	0	4	
46	10	47	1	Bony Coal	0	3	} Higginbotham coal bed
47	1	47	5	Broken coal (25" core recovered, mostly clay)	0	4	
47	5	47	7	Bony coal	0	2	
47	7	49	0	Claystone	1	5	
49	0	49	10	Carbonaceous claystone	0	10	
49	10	50	9	Claystone with sandy streaks	0	11	
50	9	51	6	Claystone with sandy streaks	0	9	
51	6	52	7	Silty claystone	1	1	
52	7	65	9	Sandstone; streaks of coal at 56' 9" and 65' 6"	13	2	

Log of core drill hole no. 9-20-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
65	9	66	9	Shale and sandstone	1	0	
66	9	83	0	Medium-grained sandstone with occasional shale fragments and carbonaceous partings	16	3	
83	0	86	0	Sandstone; many clay pellets and fragments of ferruginous concretions and fossil plants	3	0	
86	0	105	0	Medium-grained sandstone	19	0	
105	0	110	10	Claystone	5	10	
110	10	112	6	Coal (5½" core recovered)	1	8	Fairview coal bed * (adjusted to conform to the laboratory analysis)
112	6	113	1	Clay and coal } (12½" core	0	7	
113	1	114	2	Coal, thin clay partings } recovered)	1	1	
114	2	114	9	Clay, streaks of coal	0	7	
114	9	115	3	Carbonaceous claystone; streak of coal near base	0	6	
115	3	117	3	Carbonaceous slickensided claystone	2	0	
117	3	119	0	Claystone	1	9	
119	0	140	6	Thin-bedded shaly siltstone with lenticular sandy partings	21	6	
140	6	150	6	Shaly claystone	10	0	
150	6	166	6	Fine-grained sandstone	16	0	
166	6	192	0	Clayey siltstone with lenticular sandy partings	25	6	
192	0	202	4	Sandstone	10	4	
202	4	213	6	Shaly claystone with scattered sandy partings	11	2	
213	6	236	6	Thin-bedded sandstone and shale	23	0	
236	6	242	0	Medium-grained sandstone with fragments of ferruginous concretions in the top and bottom	5	6	
242	0	254	0	Shaly claystone, sandy at base	12	0	
254	0	264	0	Sandstone with occasional silty partings and pellets of claystone	10	0	
264	0	265	6	Claystone	1	6	
265	6	267	0	Siltstone	1	6	
267	0	278	10	Shaly claystone with scattered ferruginous concretions	11	10	
278	10	280	2	Coal, with thin clayey partings (9" core recovered)	1	4	New coal bed
280	2	280	4	Clay and coal (no core recovered)	0	2	
280	4	311	0	Shaly claystone with scattered streaks of sand and ferruginous concretions; slickensides at 305'	30	8	
311	0	316	0	Sandstone with scattered claystone pellets	5	0	
316	0	325	0	Shaly claystone	9	0	
325	0	331	0	Shale with sandy partings	6	0	
331	0	345	0	Sandstone with shaly partings in the lower 3'	14	0	
345	0	393	0	Shaly claystone with sandy lenticular partings; scattered ferruginous concretions	48	0	
393	0	401	0	Thin-bedded sandstone with silty partings	8	0	
401	0	417	0	Thin-bedded claystone and sandstone	16	0	

Log of core drill hole no. 9-20-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
417	0	433	6	Shaly claystone; ferruginous concretions; sandy partings in middle and bottom	16	6	
433	6	443	0	Thin-bedded claystone and sandstone	9	6	
443	0	456	6	Shaly claystone; ferruginous concretions and scattered silty partings	13	6	
456	6	457	10	Coal (12" core recovered)	1	4	Upper Chapman coal bed
457	10	471	0	Claystone	13	2	
471	0	477	6	Thin-bedded siltstone	6	6	
477	6	534	6	Fine-grained thick-bedded sandstone with scattered claystone partings	57	0	
534	6	558	5	Shaly claystone, silty in the lower part	23	11	
558	5	559	0	Coal	0	7	Lower Chapman coal bed
559	0	559	1	Clay	0	1	
559	1	559	5	Clay and coal	0	4	
559	5	561	0	Claystone	1	7	
561	0	563	0	Siltstone	2	0	
				Total depth 563 feet.			

Log of core drill hole no. 10-10-CA

Location: 600 feet north and 100 feet east of the southwest corner of sec. 10, T. 15 S., R. 4 E.

Altitude: 570 feet.

0	0	5	4	Soil and weathered rock	5	4	
5	4	35	4	Sandstone; clay parting at 17'; scattered claystone pellets 30' to 32'; plant fossils 34' to 35'	30	0	
35	4	48	0	Shaly lenticular thin-bedded siltstone; dip 30°	12	8	
48	0	55	1½	Silty and shaly claystone	7	1½	
55	1½	56	0	Coal (8" core recovered)	0	10½	Fairview coal bed
56	0	56	1½	Clay and coal (no core recovered)	0	1½	
56	1½	56	5	Clay	0	3½	
56	5	56	7	Coal	0	2	
56	7	56	9½	Clay	0	2½	
56	9½	57	1	Coal	0	3½	
57	1	57	6½	Clay	0	5½	
57	6½	57	9	Coal	0	2½	
57	9	62	0	Claystone slightly carbonaceous	4	3	
62	0	76	6	Claystone	14	6	
76	6	84	0	Shaly lenticular thin-bedded siltstone; dip 20°	7	6	
84	0	97	0	Sandstone with occasional shale partings	13	0	
97	0	98	6	Siltstone	1	6	
98	6	104	0	Sandstone	5	6	
104	0	138	0	Shaly siltstone with sandy lenticular partings; dip 15°	34	0	
138	0	142	0	Sandstone with thin shaly beds	4	0	

Log of core drill hole no. 10-10-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
142	0	186	0	Shaly siltstone; many sandy partings in the lower part	44	0	
186	0	206	0	Sandstone with silty partings and two claystone conglomerates	20	0	
206	0	209	9	Siltstone	3	9	
209	9	210	0	Claystone conglomerate	0	3	
210	0	228	0	Shaly claystone with scattered ferruginous concretions; dip 10°-15°	18	0	
228	0	234	0	Sandy thin-bedded siltstone	6	0	
234	0	262	6	Thin-bedded sandstone; coaly partings and clay pellets in lower 3′	28	6	
262	6	266	0	Silicinate sandstone	3	6	
266	0	274	6	Thin-bedded siltstone and claystone	8	6	
274	6	276	6	Sandstone	2	0	
276	6	284	6	Thin-bedded lenticular sandstone and claystone	8	0	
284	6	296	6	Sandstone with silty partings	12	0	
296	6	340	0	Shaly claystone; sandy partings in the lower 30′	43	6	
340	0	358	0	Thin-bedded lenticular claystone and sandstone	18	0	
358	0	373	0	Shaly claystone with scattered sandy partings	15	0	
373	0	386	6	Thin-bedded sandstone with shale partings	13	6	
386	6	402	8	Claystone with silty partings; sandy in the bottom 2′	16	2	
402	8	403	0½	Siltstone	0	4½	
403	0½	404	0	Coal	0	11½	Upper Chapman coal bed
404	0	404	0½	Clay (10″ core recovered)	0	0½	
404	0½	404	6	Coal (10″ core recovered)	0	5½	
404	6	406	4	Carbonaceous claystone	1	10	
406	4	413	3	Shaly slickensided claystone	6	11	
413	3	413	6	Coal (1½″ core recovered)	0	3	
413	6	414	9	Claystone	1	3	
414	9	421	0	Thin-bedded claystone with silty partings; becomes sandy at the base	6	3	
421	0	435	9	Sandstone with scattered silty partings	14	9	
435	9	436	5	Siltstone conglomerate	0	8	
436	5	468	5	Medium-grained sandstone	32	0	
468	5	473	5	Shaly claystone	5	0	
473	5	477	0	Shaly thin-bedded siltstone with lenticular sandy partings	3	7	
477	0	478	0	Slickensided claystone	1	0	
478	0	491	9½	Siltstone	13	9½	
491	9½	492	0	Claystone	0	2½	
492	0	492	10½	Coal (2½″ core recovered)	0	10½	Lower Chapman coal bed
492	10½	493	8	Clay with many plant fossils	0	9½	
493	8	498	0	Silty claystone	4	4	

Total depth 498 feet.

Log of core drill hole no. 11-21-CA

Location: 2,200 feet north and 2,480 feet east of the southwest corner of sec. 21, T. 15 S., R. 4 E.
Altitude: 560 feet.

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
0	0	5	0	Weathered rock	5	0	
5	0	58	0	Medium-grained sandstone, with streaks of coal from 38′ to 43′	53	0	
58	0	61	0	Claystone	3	0	
61	0	137	1	Sandstone with streaks of coal from 88′ to 89′ and claystone conglomerate from 90′ 6″ to 91′ 0″ and from 136′ 0″ to 137′ 1″	76	1	
137	1	137	2½	Coal	0	1½	
137	2½	156	0	Medium-grained sandstone, carbonaceous in places, with claystone conglomerate from 148′ to 149′	18	9½	
156	0	165	0	Shaly claystone; silty in the upper part; concretions in the lower part	9	0	
165	0	174	0	Sandstone with scattered silty partings	9	0	
174	0	183	6	Thin-bedded siltstone with scattered sandy partings	9	6	
183	6	197	0	Thin-bedded fine-grained sandstone with silty partings	13	6	
197	0	204	0	Thick-bedded siltstone, clayey at bottom	7	0	
204	0	210	0	Shaly claystone with ferruginous concretions; dip 10°	6	0	
210	0	217	0	Siltstone and claystone	7	0	
217	0	229	0	Shaly claystone; silty in places	12	0	
229	0	232	0	Slickensided claystone	3	0	
232	0	232	1	Coal	0	1½	Broken Arrow coal bed
232	1	232	1½	Claystone	0	½	
232	1½	232	4	Coal with ¼″ streak of pyrite	0	2½	
232	4	232	5	Claystone	0	1	
232	5	232	6½	Coal	0	1½	
232	6½	232	7	Claystone and coal	0	½	
232	7	233	0	Claystone	0	5	
233	0	233	5	Coaly claystone	0	5	
233	5	239	0	Claystone, carbonaceous with scattered ferruginous concretions	5	7	
239	0	252	9	Carbonaceous medium-grained sandstone; dip 7°	13	9	
252	9	255	0	Clayey siltstone	2	3	
255	0	270	4	Sandstone with coaly partings at 264′ and 267′	15	4	
270	4	274	0	Silty claystone	3	8	
274	0	276	0	Claystone conglomerate with coaly streaks in coarse sand matrix	2	0	
276	0	277	5	Sandstone; dip 15°	1	5	
277	5	281	6	Claystone with streaks of coal	1	1	
281	6	281	10	Coal	0	4	
281	10	282	0	Slickensided claystone	0	2	
282	0	282	6	Claystone	0	6	
282	6	286	0	Siltstone	3	6	

Log of core drill hole no. 11-21-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
286	0	300	0	Cross-bedded, fine-grained sandstone, very silty in lower 5 feet	14	0	
300	0	313	0	Shaly claystone becoming carbonaceous in lower part	13	0	
313	0	313	10	Claystone with streaks of coal	0	10	
313	10	314	0	Coal and claystone	0	2	} Marion
314	0	315	1	Coal	1	1	} coal bed
315	1	315	9	Carbonaceous claystone	0	8	
315	9	318	6	Claystone becoming silty in lower part	2	9	
318	6	327	0	Clayey siltstone	8	6	
327	0	337	0	Cross-bedded fine-grained sandstone	10	0	
337	0	342	0	Siltstone, sandy in upper part, shaly in lower part	5	0	
342	0	344	0	Claystone, carbonaceous at the base	2	0	
344	0	344	6	Coal with streaks of clay	0	6	
344	6	344	8	Coaly claystone	0	2	
344	8	345	0	Claystone	0	4	
345	0	347	0	Siltstone	2	0	
347	0	350	0	Claystone	3	0	
350	0	355	0	Cross-bedded fine-grained sandstone, silty near the bottom	5	0	
355	0	359	0	Siltstone	4	0	
359	0	363	6	Shaly claystone	4	6	
363	6	364	5	Carbonaceous claystone	0	11	
364	5	365	9	Claystone with streaks of coal	1	4	
365	9	366	0	Coaly claystone	0	3	
366	0	366	2	Coal	0	2	
366	2	367	3	Coaly claystone	1	1	
367	3	368	7	Carbonaceous claystone	1	4	
368	7	400	0	Fine- and medium-grained sandstone, mostly thick-bedded; dip 10°	31	5	
400	0	407	6	Thin-bedded sandstone wtih shaly partings	7	6	
407	6	424	6	Siltstone with lenticular sandy partings	17	0	
424	6	427	3	Claystone	2	9	
427	3	433	3	Sandstone	6	0	
433	3	435	0	Shaly claystone	1	9	
435	0	437	6	Siltstone	2	6	
437	6	448	0	Claystone; silty and sandy in lower part	10	6	
448	0	449	0	Sandstone	1	0	
449	0	497	6	Claystone, shaly or silty in places; coal streaks at 470′	48	6	
497	6	506	6	Thick-bedded siltstone	9	0	
506	6	512	6	Shaly claystone	6	0	
512	6	514	1	Shaly carbonaceous claystone	1	7	
514	1	514	11	Coal (8″ core recovered)	0	10	} Bibby zone
							} coal bed
514	11	515	6	Claystone with carbonaceous fragments	0	7	
515	6	556	6	Medium-grained sandstone; scattered claystone pellets from 547′ to 554′; and streaks of coal from 555′ to 557′	41	0	

Log of core drill hole no. 11-21-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
556	6	557	2	Claystone conglomerate	0	8	
557	2	562	0	Sandstone	4	10	
562	0	562	6	Carbonaceous claystone	0	6	
562	6	570	0	Siltstone	7	6	
570	0	590	0	Sandstone	20	0	
590	0	594	0	Siltstone with sandy partings	4	0	
594	0	609	6	Sandstone, conglomeratic 598′ 9″ to 599′ 6″ and 604′ 6″ to 606′ 6″	15	6	
609	6	614	0	Sandy siltstone	4	6	
614	0	619	1	Coarse-grained sandstone	5	1	
619	1	619	4	Claystone and sandstone	0	3	
619	4	619	6	Coaly claystone	0	2	
619	6	619	10	Coal	0	4	
619	10	625	8	Carbonaceous claystone	5	10	
625	8	627	2	Coaly claystone	1	6	
627	2	636	6	Slickensided, carbonaceous claystone; coaly zone at 631′	9	4	
636	6	639	6	Claystone with ankerite spherules	3	0	
639	6	645	6	Siltstone, sandy near bottom	6	0	
645	6	668	0	Thin-bedded sandstone with shale partings	22	6	
668	0	678	6	Shaly siltstone, ferruginous lenses and sandy partings	10	6	
678	6	697	9	Shaly claystone with ferruginous lenses and scattered sandy lenticular partings	19	3	
697	9	699	4	Carbonaceous claystone; sandy near the bottom	1	7	
699	4	699	10	Coal	0	6	Brown coal bed
699	10	700	0	Claystone	0	2	
700	0	700	4	Coal; streak of clay	0	4	
700	4	705	7	Silty carbonaceous claystone	5	3	
705	7	708	7	Siltstone	3	0	
708	7	716	9	Silty carbonaceous claystone	8	2	
716	9	719	4	Thin-bedded siltstone with shale partings	2	7	
719	4	723	2	Thick-bedded siltstone	3	10	
723	2	724	5	Cross-bedded sandstone	1	3	
724	5	754	6	Thin-bedded siltstone with sandy lenticular partings and scattered ferruginous lenses	30	1	
754	6	761	6	Shaly claystone with ferruginous lenses	7	0	
761	6	774	0	Thin-bedded claystone with many sandy lenticular partings and scattered ferruginous lenses	12	6	
774	0	782	6	Thin-bedded siltstone; sandy at the top	8	6	
782	6	785	6	Thin-bedded sandstone with shale partings	3	0	
785	6	790	0	Thin-bedded claystone with sandy partings	4	6	
790	0	798	3	Thin-bedded sandstone with shale partings at the top and bottom	8	3	

Log of core drill hole no. 11-21-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
798	3	800	6	Carbonaceous claystone	2	3	
800	6	815	0	Thin-bedded siltstone and sandstone	14	6	
815	0	850	0	Shaly or sandy siltstone becoming clayey near bottom	35	0	
850	0	882	0	Silty and shaly claystone	32	0	
882	0	888	0	Sandy claystone	6	0	
888	0	898	0	Silty sandstone	10	0	
898	0	915	3	Thin-bedded shaly siltstone with sandy lenticular partings and numerous ferruginous lenses	17	3	
915	3	945	7	Silty and shaly claystone with sandy lenticular partings	30	4	
945	7	946	1	Shaly claystone	0	6	
946	1	947	1	Coal (9½" core recovered)	1	0	) Gann coal bed
947	1	947	2	Coaly clay with pyrite	0	1	
947	2	948	0	Claystone	0	10	
948	0	950	6	Thin-bedded sandy siltstone	2	6	
950	6	962	6	Silty sandstone	12	0	
962	6	964	7	Shaly siltstone with plant fossils	2	1	
964	7	965	9	Coal with two ¼" to ½" streaks of coaly claystone (8½" core recovered)	1	2	} Higginbotham coal bed
965	9	966	9	Coaly claystone grading into carbonaceous claystone	1	0	
966	9	977	0	Carbonaceous claystone	10	3	
977	0	982	9	Silty claystone	5	9	
982	9	993	9	Siltstone	11	0	
993	9	1012	9	Medium-grained sandstone with claystone conglomerate 1,007' to 1,008'	19	0	
1012	9	1027	0	Siltstone; clayey in upper part	14	3	
1027	0	1028	0	Sandstone	1	0	
1028	0	1038	2	Siltstone	10	2	
1038	2	1039	10	Silty claystone	1	8	
1039	10	1039	11	Claystone	0	1	
1039	11	1040	2	Coal (3½" core recovered)	0	3	} Fairview coal bed
1040	2	1040	7	Coaly claystone	0	5	
1040	7	1041	3	Coal (3" core recovered)	0	8	
1041	3	1041	5	Claystone	0	2	
1041	5	1042	3	Coal (2½" core recovered)	0	10	
1042	3	1043	2	Coaly claystone (5" core recovered)	0	11	
1043	2	1047	0	Carbonaceous claystone with streaks of coal	3	10	

Total depth 1,047 feet.

Log of core drill hole no. 12-29-CA

Location: 1,700 feet south and 1,040 feet west of northeast corner of sec. 29, T. 15 S., R. 4 E.

Altitude: 615 feet.

0	0	23	0	Weathered rock	23	0
23	0	25	0	Silty claystone	2	0
25	0	31	0	Siltstone with sandy partings in the middle	6	0
31	0	34	0	Shaly siltstone	3	0

Log of core drill hole no. 12-29-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
34	0	42	0	Shaly claystone	8	0	
42	0	48	0	Thick-bedded siltstone	6	0	
48	0	55	0	Carbonaceous thin-bedded siltstone; ferruginous concretions	7	0	
55	0	63	0	Fine-grained standstone grading down to siltstone; carbonaceous; dip 5° to 10°	8	0	
(Lost water at 61′ in crevice)							
63	0	71	0	Thick-bedded siltstone with ferruginous lenses	8	0	
71	0	72	2	Claystone (3″ core recovered)	1	2	
72	2	72	9	Coal	0	7	Broken Arrow coal bed
72	9	74	10	Carbonaceous clay; 1″ to 2″ streak of coal at about 73′ 9″ and 74′ 3″	2	1	
74	10	75	6	Coal with streaks of clay	0	8	
75	6	75	8	Coaly claystone	0	2	
75	8	79	6	Claystone with coal partings	3	10	
79	6	81	0	Siltstone	1	6	
81	0	96	0	Medium-grained sandstone, carbonaceous partings 90′ - 92′	15	0	
96	0	100	8	Clay	4	8	
100	8	110	6	Sandstone; dip 5°; crevice at 105′	9	10	
110	6	113	0	Siltstone	2	6	
113	0	122	10	Sandstone	9	10	
122	10	125	6	Carbonaceous claystone with streaks clay	2	8	
125	6	129	6	Claystone	4	0	
129	6	131	0	Sandstone	1	6	
131	0	139	0	Shaly siltstone with scattered streaks of coal; becomes clayey near bottom	8	0	
139	0	141	6	Claystone	2	6	
141	6	148	0	Siltstone	6	6	
148	0	150	6	Shaly and silty claystone	2	6	
150	6	152	9	Carbonaceous claystone	2	3	
152	9	153	9	Coaly claystone	1	0	
153	9	155	1	Coal	1	4	Marion coal bed
155	1	156	6	Claystone	1	5	
156	6	157	3	Claystone; streaks of coal	0	9	
157	3	166	6	Claystone	9	3	
166	6	168	6	Siltstone	2	0	
168	6	179	0	Sandstone	10	6	
179	0	181	2	Shaly siltstone	2	2	
181	2	184	0	Slickensided claystone	2	10	
184	0	184	8	Coal and clay	0	8	
184	8	189	0	Siltstone	4	4	
189	0	196	6	Claystone	7	6	
196	6	205	0	Siltstone and claystone	8	6	
205	0	206	0	Fine-grained sandstone	1	0	
206	0	211	10	Clayey siltstone	5	10	
211	10	212	4	Coal (3″ core recovered)	0	6	
212	4	212	5	Claystone	0	1	
212	5	213	2	Coal and clay (1½″ core recovered)	0	9	
213	2	220	0	Clayey siltstone	6	10	
220	0	238	0	Silty claystone, many plant fossils	18	0	
238	0	241	0	Thin-bedded sandy siltstone	3	0	

Log of core drill hole no. 12-29-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
241	0	246	0	Fine-grained sandstone	5	0	
246	0	257	0	Shaly claystone; sandy at the top; scattered ferruginous lenses	11	0	
57	0	277	0	Thin-bedded siltstone and lenticular sandstone; shaly near bottom	20	0	
277	0	281	6	Silty claystone	4	6	
281	6	289	6	Thin-bedded sandstone; shaly near bottom	8	0	
289	6	300	0	Shaly siltstone	10	6	
300	0	305	6	Sandstone with irregular shale partings	5	6	
305	6	311	0	Shaly claystone with scattered thin sandy lenses	5	6	
311	0	358	6	Claystone with scattered ferruginous lenses and silty zones	47	6	
358	6	368	0	Siltstone	9	6	
368	0	374	0	Claystone with ferrruginous lenses	6	0	
374	0	375	6	Slickensided carbonaceous claystone	1	6	
375	6	376	2	Coal with thin streaks of clay at the top and bottom (4" core recovered)	0	8	Bibby zone of coal beds
376	2	380	6	Siltstone with many plant fossils	4	4	
380	6	395	0	Claystone with coaly streaks and scattered ferruginous concretions; in places slickensided	14	6	
395	0	400	0	Siltstone and claystone	5	0	
400	0	415	6	Cross-bedded sandstone with silty partings	15	6	
415	6	421	0	Siltstone, sandy at the bottom	5	6	
421	0	426	2	Claystone; carbonaceous and slickensided in bottom	5	2	
426	2	471	6	Silty sandstone grading into sandstone	45	4	
471	6	475	0	Shaly claystone	3	6	
475	0	479	0	Carbonaceous claystone	4	0	
479	0	479	3	Coal	0	3	
479	3	483	1	Carbonaceous claystone	3	10	
483	1	488	0	Claystone with ankerite spherules	4	11	
488	0	494	6	Claystone	6	6	
494	6	496	6	Carbonaceous slickensided claystone	2	0	
496	6	510	0	Siltstone	13	6	
510	0	539	6	Sandstone	29	6	
539	6	551	0	Silty and shaly claystone	11	6	
551	0	551	7	Coal (5" core recovered)	0	7	Brown coal bed
551	7	551	8	Claystone	0	1	
551	8	551	10	Bony coal	0	2	
551	10	554	2	Carbonaceous claystone grades into siltstone	2	4	
554	2	556	0	Sandstone	1	10	
556	0	566	8	Siltstone and claystone; in part shaly	10	8	
566	8	611	0	Shaly silty claystone; ferruginous concretions in lower part	44	4	
611	0	623	0	Shaly claystone with scattered sandy lenticular partings	12	0	
623	0	627	0	Thin-bedded sandstone	4	0	

Log of core drill hole no. 12-29-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
627	0	631	6	Siltstone	4	6	
631	6	652	0	Shaly claystone with ferruginous concretions; coal streaks near bottom	20	6	
652	0	654	6	Thin-bedded siltstone	2	6	
654	6	657	6	Sandstone	3	0	
657	6	661	0	Thin-bedded siltstone and claystone	3	6	
661	0	665	6	Sandstone	4	6	
665	6	669	0	Siltstone and sandstone	3	6	
669	0	744	6	Shaly siltstone	75	6	
744	6	748	0	Sandstone	3	6	
748	0	751	0	Coarse siltstone	3	0	
751	0	790	8	Thin-bedded claystone with sandy partings and ferruginous lenses	39	8	
790	8	791	7	Coal (10″ core recovered)	0	11	) Gann coal bed
791	7	795	4	Thin-bedded siltstone with shaly partings	3	9	
795	4	813	0	Thin-bedded siltstone and sandstone	17	8	
813	0	813	3	Silty claystone	0	3	
813	3	813	5	Carbonaceous claystone	0	2	
813	5	814	0	Coal (9″ broken core recovered)	0	7	) Higginbotham coal bed
814	0	814	3	Claystone (9″ broken core recovered)	0	3	
814	3	814	8	Dirty coal (9″ broken core recovered)	0	5	
814	8	817	4	Claystone (18″ core recovered)	2	8	
817	4	820	6	Carbonaceous sandy siltstone	3	2	
820	6	852	6	Sandstone with scattered shale partings; streaks of coal near the base	32	0	
852	6	857	6	Claystone conglomerate	5	0	
857	6	864	0	Sandstone	6	6	
864	0	867	0	Siltstone and sandstone	3	0	
867	0	874	9	Thin-bedded sandstone with silty partings	7	9	
874	9	880	10	Coarse-grained sandstone with streaks of coal	6	1	
880	10	882	6	Siltstone	1	8	
882	6	885	6	Thin-bedded siltstone with ferruginous concretions grading down into claystone	3	0	
885	6	889	9	Claystone with ferruginous concretions	4	3	
889	9	891	0	Coal	1	3	)
891	0	891	2	Coal and clay	0	2	|
891	2	891	4	Claystone	0	2	|
891	4	891	10	Coal	0	6	} Fairview
891	10	891	11	Coal and clay	0	1	| coal bed
891	11	892	3½	Claystone with streaks of coal	0	4½	|
892	3½	893	7	Coal	1	3½	)
893	7	893	10	Coaly clay	0	3	
893	10	899	4	Claystone	5	6	
899	4	899	5	Coal	0	1	
899	5	901	5	Claystone	2	0	
901	5	910	6	Silty claystone with ferruginous concretions interbedded with thin sandstone	9	1	

Log of core drill hole no. 12-29-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.
910	6	960	6	Sandstone with shaly partings and scattered pellets of shale	50	0
960	6	963	0	Siltstone with sandy partings	2	6

Strata are essentially horizontal.
Total depth 963 feet.

Log of core drill hole no. 13C-16-CA

This log is representative of the records of holes nos. 13, 13A and 13B drilled close by.

Location: 2,540 feet south and 1,920 feet east of the northwest corner, sec. 16, T. 15 S., R. 4 E.

Altitude: 520 feet.

0	0	16	0	Soil and siltstone	16	0	
16	0	32	10	Clayey and micaceous siltstone with sandy partings	16	10	
32	10	38	2	Thin-bedded siltstone with scattered clay pellets	5	4	
38	2	48	10	Shaly siltstone with ferruginous concretions; dip 15°	10	8	
48	10	84	7	Silty and shaly claystone with ferruginous concretions	35	9	
84	7	126	1	Claystone with sandy lenticular partings and ferruginous concretions	41	6	
126	1	126	4	Coal	0	3	) Gann coal bed
126	4	147	5	Siltstone and claystone in gradational bands	21	1	
147	5	148	3	Coal	0	10	} Higginbotham coal bed
148	3	151	4	Slickensided claystone with streaks of coal	3	1	
151	4	151	8	Coal and claystone	0	4	
151	8	155	8	Carbonaceous and slickensided claystone	4	0	
155	8	157	8	Siltstone	2	0	
157	8	162	8	Medium-grained sandstone	5	0	
162	8	163	0	Siltstone and claystone	0	4	
163	0	174	6	Medium-grained sandstone	11	6	
174	6	179	8	Sandstone with streaks of coal	5	2	
179	8	189	11	Medium-grained sandstone	10	3	
189	11	191	7	Claystone conglomerate with large pieces of plant fossils in sand matrix	1	8	
191	7	195	7	Clayey siltstone with streaks and slumped masses of sandstone	4	0	
195	7	205	3	Medium-grained sandstone	9	8	
205	3	206	5	Sandstone with streaks of coal	1	2	
206	5	210	1	Sandstone	3	8	
210	1	213	7	Thin-bedded claystone with silty partings and ferruginous concretions	3	6	
213	7	214	10	Coal	1	3	} Fairview coal bed
214	10	215	0	Claystone	0	2	
215	0	215	8	Coal	0	8	
215	8	216	2	Claystone and coal	0	6	
216	2	219	5	Claystone with streaks of coal	3	3	
219	5	220	0	Claystone	0	7	

Total depth 220 feet.

Log of core drill hole no. 14-29-CA

Location: 300 feet north and 1,780 feet east of the southwest corner of sec. 29, T. 15 S., R. 4 E.
Altitude: 545 feet.

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
0	0	14	0	Soil and weathered rock	14	0	
14	0	23	0	Sandstone with carbonaceous partings	9	0	
23	0	25	0	Silty claystone	2	0	
25	0	26	0	Sandstone	1	0	
26	0	38	6	Shaly claystone; dip 7°	12	6	
38	6	43	6	Medium-grained sandstone	5	0	
43	6	60	0	Thin-bedded clayey siltstone with sandy partings	16	6	
60	0	73	0	Thin-bedded sandstone with clayey partings	13	0	
73	0	77	0	Thin-bedded clayey siltstone with sandy partings	4	0	
77	0	98	5	Silty carbonaceous claystone; dip 7° to 10°	21	5	
98	5	99	5	Coal (6″ core recovered)	1	0	Broken Arrow coal bed
99	5	100	2	Claystone with streaks of coal (6″ core recovered)	0	9	
100	2	100	11	Claystone	0	9	
100	11	101	2	Coal	0	3	
101	2	101	5	Clay	0	3	
101	5	101	10	Coal (4″ core recovered)	0	5	
101	10	102	1	Claystone	0	3	
102	1	102	5	Coal (3″ core recovered)	0	4	
102	5	102	8	Claystone	0	3	
102	8	103	4	Coal (6″ core recovered)	0	8	
103	4	103	10	Claystone grading into siltstone	0	6	
103	10	105	0	Siltstone	1	2	
105	0	131	0	Medium-grained sandstone	26	0	
131	0	134	6	Siltstone	3	6	
134	6	150	0	Sandstone with carbonaceous and shaly partings	15	6	
150	0	150	4	Siltstone	0	4	
150	4	150	8	Claystone	0	4	
150	8	150	10	Clay and coal (no core)	0	2	
150	10	151	8	Carbonaceous clay	0	10	
151	8	151	10	Coal and clay	0	2	
151	10	153	8	Claystone and coal	1	10	
153	8	153	11	Coal	0	3	
153	11	154	5	Claystone	0	6	
154	5	154	6	Coal and clay	0	1	
154	6	154	8	Coal	0	2	
154	8	154	11	Claystone	0	3	
154	11	162	0	Siltstone	7	1	
162	0	168	9	Claystone	6	9	
169	9	179	9	Sandy cross-bedded siltstone	11	0	
179	9	185	2	Carbonaceous claystone	5	5	
185	2	186	3	Coal (12″ core recovered)	1	1	
186	3	186	8	Siltstone	0	5	Marion coal bed
186	8	191	8	Slickensided, very carbonaceous claystone	5	0	

Log of core drill hole no. 14-29-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
191	8	194	3	Slickensided claystone	2	7	
194	3	195	3	Claystone with streaks of coal	1	0	
195	3	197	9	Carbonaceous claystone	2	6	
197	9	198	2	Coal and coaly claystone	0	5	
198	2	198	9	Siltstone	0	7	
198	9	209	0	Coarse- to medium-grained sandstone	10	3	
209	0	213	6	Claystone	4	6	
213	6	213	9	Coal	0	3	
213	9	214	0	Coal and clay	0	3	
214	0	214	8	Claystone	0	8	
214	8	220	11	Claystone with many plant fossils	6	3	
220	11	221	5	Claystone	0	6	
221	5	221	8	Shaly coal	0	3	
221	8	221	11	Coaly claystone	0	3	
221	11	222	4	Coal	0	5	
222	4	223	0	Claystone	0	8	
223	0	227	0	Siltstone	4	0	
227	0	266	0	Sandstone	39	0	
266	0	308	0	Clayey siltstone with scattered small lenses and wisps of sandstone	42	0	
308	0	324	0	Thin-bedded and cross-bedded siltstone and sandstone	16	0	
324	0	335	0	Thin-bedded sandstone with shale partings	11	0	
335	0	340	0	Claystone with ferruginous concretions	5	0	
340	0	362	0	Siltstone with sandy partings and ferruginous concretions; dip 7°	22	0	
362	0	363	0	Slickensided claystone	1	0	
363	0	389	0	Shaly siltstone and claystone; scattered ferruginous concretions	26	0	
389	0	396	0	Silty claystone with streaks of coal	7	0	
396	0	405	6	Thick-bedded siltstone	9	6	
405	6	413	6	Shaly claystone with scattered streaks of coal and ferruginous concretions	8	0	
413	6	438	0	Thin-bedded cyclic siltstone and sandstone; dip 8°	24	6	
438	0	441	7	Shaly claystone	3	7	
441	7	442	2	Coal (3½" core recovered)	0	7	Bibby zone of coal beds
442	2	444	0	Carbonaceous claystone with thin streaks of coal; many plant fossils	1	10	
444	0	444	1	Coaly claystone	0	1	
444	1	444	8	Claystone with streaks of coal	0	7	
444	8	445	0	Coaly claystone	0	4	
445	0	446	0	Claystone and coaly claystone	1	0	
446	0	450	0	Claystone with ferruginous concretions	4	0	
450	0	459	0	Thin-bedded siltstone with sandy partings	9	0	
459	0	462	11	Claystone grading into carbonaceous claystone	3	11	
462	11	463	2	Coal and clay (no core recovered)	0	3	
463	2	463	6	Claystone	0	4	
463	6	463	7	Coaly claystone	0	1	

Log of core drill hole no. 14-29-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
403	7	465	2	Claystone; thin streaks of coal	1	7	
465	2	465	7	Coaly claystone	0	5	
465	7	466	1	Clay	0	6	
466	1	466	10	Carbonaceous claystone	0	9	
466	10	479	0	Thick-bedded sandstone with scattered shaly partings	12	2	
479	0	503	0	Shaly claystone; dip 0°	24	0	
503	0	509	0	Siltstone and claystone	6	0	
509	0	524	6	Silty claystone, many plant fossils	15	6	
524	6	530	0	Slickensided claystone with many small spherules of ankerite	5	6	
530	0	537	0	Claystone	7	0	
537	0	580	0	Sandstone with scattered pellets of clay and streaks of coal	43	0	
580	0	586	3	Slickensided thin-bedded siltstone with sandy lenticular partings and ferruginous concretions	6	3	
586	3	586	9	Silty claystone	0	6	
586	9	587	0	Coal	0	3	
587	0	587	3	Carbonaceous claystone	0	3	
587	3	592	7	Shaly claystone with ferruginous concretions	5	4	
592	7	593	5	Slickensided carbonaceous claystone	0	10	
593	5	594	2	Coal	0	9	) Brown coal bed
594	2	594	3	Coaly clay	0	1	
594	3	595	0	Claystone	0	9	
595	0	596	6	Claystone	1	6	
596	6	607	6	Thin-bedded silty sandstone with shale partings	11	0	
607	6	652	0	Clayey and shaly siltstone; dip 5°	44	6	
652	0	666	0	Thin-bedded siltstone with lenticular sandy partings	14	0	
666	0	696	6	Clayey siltstone with streak of coal at 692′	30	6	
696	6	700	6	Fine-grained sandstone	4	0	
700	6	702	6	Sandy siltstone	2	0	
702	6	709	6	Sandstone and siltstone	7	0	
709	6	724	0	Siltstone	14	6	
724	0	728	0	Shaly and silty claystone; dip 7°	4	0	
728	0	789	8	Shaly siltstone and claystone; scattered sandy partings in lower 6′	61	8	
789	8	792	10	Silty sandstone	3	2	
792	10	797	0	Sandy siltstone	4	2	
797	0	829	6	Shaly siltstone with sandy partings and ferruginous lenses	32	6	
829	6	831	6	Sandstone with scattered shale pellets	2	0	
831	6	833	11	Shaly claystone with ferruginous concretions	2	5	
833	11	835	3	Bright coal	1	4	) Gann coal bed

Log of core drill hole no. 14-29-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
835	3	835	7	Claystone	0	4	
835	7	852	6	Thin-bedded siltstone with sandy partings	16	11	
852	6	853	3	Bright coal (8" core recovered)	0	9	Higginbotham coal bed
853	3	853	4	Coaly claystone	0	1	
853	4	854	5	Highly carbonaceous and slickensided claystone	1	1	
854	5	858	7	Carbonaceous claystone with nodules of ankerite in lower half	4	2	
858	7	860	0	Siltstone	1	5	
860	0	862	6	Fine-grained sandstone	2	6	
862	6	866	0	Siltstone	3	6	
866	0	890	4	Medium-grained sandstone	24	4	
890	4	920	0	Laminated claystone and siltstone with scattered ferruginous concretions; becomes sandy in lower part	29	8	
920	0	922	3	Shaly claystone	2	3	
922	3	923	4	Bright coal	1	1	
923	4	923	5½	Bone	0	1½	
923	5½	923	10	Clayey coal	0	4½	
923	10	923	11½	Coaly claystone	0	1½	Fairview coal bed
923	11½	924	4½	Coal	0	5	
924	4½	924	6	Coaly claystone	0	1½	
924	6	925	6	Bright coal	1	0	
925	6	932	0	Carbonaceous slickensided claystone	6	6	

Total depth 932 feet.

Log of core drill hole no. 15-21-CA

Location: 1,980 feet south and 1,450 feet east of the northwest corner of sec. 21, T. 15 S., R. 4 E.

Altitude: 615 feet.

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
0	0	4	0	Sandy soil	4	0	
4	0	16	0	Fine- to medium-grained cross-bedded carbonaceous sandstone	12	0	
16	0	24	0	Thin-bedded micaceous siltstone with sandy partings	8	0	
24	0	29	0	Shaly micaceous siltstone; dip 15°	5	0	
29	0	42	6	Thin-bedded sandstone and siltstone	13	6	
42	6	50	0	Micaceous and sandy siltstone	7	6	
50	0	69	6	Shaly claystone; dip 12°	19	6	
69	6	69	10	Clay	0	4	
69	10	70	1	Coal	0	3	
70	1	70	3	Clay	0	2	
70	3	70	8	Coal	0	5	
70	8	71	0	Clay	0	4	Broken Arrow coal bed
71	0	71	8	Coal (24" core recovered)	0	8	
71	8	73	11	Clay	2	3	
73	11	75	0	Coal	1	1	

Log of core drill hole no. 15-21-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
75	0	76	9	Siltstone	1	9	
76	9	79	2	Sandstone	2	5	
79	2	79	8	Siltstone with plant fossils	0	6	
79	8	105	6	Cross-bedded sandstone	25	10	
105	6	106	2	Siltstone	0	8	
106	2	120	6	Carbonaceous sandstone	14	4	
120	6	123	0	Claystone	2	6	
123	0	123	8	Siltstone with streaks of coal	0	8	
123	8	127	8	Claystone and siltstone	4	0	
127	8	128	11	Claystone with streaks of coal	1	3	
128	11	129	3	Coal (2″ core recovered)	0	4	
129	3	132	9	Claystone with streaks of coal	3	6	
132	9	141	0	Carbonaceous claystone	8	3	
141	0	144	0	Siltstone	3	0	
144	0	149	6	Sandstone with streaks of coal	5	6	
149	6	151	9	Cross-bedded sandy siltstone	2	3	
151	9	164	3	Claystone with scattered ferruginous concretions and streaks of coal; becomes very carbonaceous in lower 5′ 5″	12	6	
164	3	165	5	Coal (9″ core recovered)	1	2	) Marion coal bed
165	5	168	11	Carbonaceous claystone	3	6	
168	11	171	0	Claystone	2	1	
171	0	174	0	Siltstone	3	0	
174	0	178	0	Claystone	4	0	
178	0	188	0	Sandy siltstone	10	0	
188	0	195	6	Silty and shaly claystone	7	6	
195	6	195	10	Carbonaceous claystone	0	4	
195	10	196	5	Coal and claystone	0	7	
196	5	196	10	Claystone	0	5	
196	10	196	11	Coal and claystone	0	1	
196	11	197	0	Claystone	0	1	
197	0	199	6	Sandstone grading into siltstone	2	6	
199	6	207	0	Shaly siltstone; dip 15°	7	6	
207	0	210	4	Claystone	3	4	
210	4	211	0	Coaly claystone with streaks of coal	0	8	
211	0	212	0	Claystone with streaks of coal	1	0	
212	0	213	6	Siltstone with plant fossils	1	6	
213	6	215	3	Claystone	1	9	
215	3	263	9	Medium-grained sandstone; streaks of coal 245′ to 246′ 6″	48	6	
263	9	276	0	Thin-bedded siltstone with lenticular sandy partings	12	3	
276	0	281	6	Thin-bedded sandstone with shaly partings	5	6	
281	6	289	0	Claystone and siltstone	7	6	
289	0	303	0	Siltstone and fine-grained sandstone	14	0	
303	0	305	6	Claystone	2	6	
305	6	309	0	Siltstone	3	6	
309	0	326	0	Carbonaceous claystone	17	0	
326	0	338	0	Silty claystone	12	0	
338	0	348	0	Slickensided carbonaceous claystone	10	0	

Log of core drill hole no. 15-21-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
348	0	352	6	Fine-grained sandstone grading into siltstone	4	6	
352	6	364	9	Carbonaceous claystone	12	3	
364	9	365	8	Bright coal (9" core recovered)	0	11	) Bibby bed
365	8	369	8	Siltstone grades into sandstone	4	0	
369	8	382	0	Fine-grained sandstone; thin bedded silty partings	12	4	
382	0	413	10	Medium-grained sandstone; dip 10°	31	10	
413	10	417	4	Conglomeratic sandstone and siltstone	3	6	
417	4	428	2	Sandstone with streaks of coal	10	10	
428	2	430	2	Claystone conglomerate with numerous coal streaks	2	0	
430	2	432	4	Carbonaceous claystone with streaks of coal in upper part	2	2	
432	4	439	5	Sandy siltstone	7	1	
439	5	442	5	Clayey siltstone	3	0	
442	5	445	5	Sandy siltstone	3	0	
445	5	454	9	Silty claystone	9	4	
454	9	458	2	Carbonaceous claystone	3	5	
458	2	460	6	Sandy siltstone	2	4	
460	6	463	0	Slickensided claystone	2	6	
463	0	474	6	Siltstone, sandy in upper part; grades into claystone	11	6	
474	6	478	0	Shaly and silty claystone	3	6	
478	0	482	10	Carbonaceous slickensided claystone	4	10	
482	10	482	11	Coal	0	1	
482	11	488	8	Claystone with nodules and spherules of ankerite in lower 3 feet	5	9	
488	8	498	8	Shaly and silty claystone; many plant fossil's	10	0	
498	8	502	4	Slickensided claystone	3	8	
502	4	509	10	Shaly siltstone	7	6	
509	10	515	7	Sandy siltstone	5	9	
515	7	554	6	Thin-bedded siltstone with lenticular sandy partings and scattered ferruginous lenses; dips 6°	38	11	
554	6	555	2	Coal (6" core recovered)	0	8	} Brown coal bed
555	2	555	9	Claystone	0	7	
555	9	555	9½	Coal	0	0½	
555	9½	555	11	Claystone	0	1½	
555	11	556	1	Coal	0	2	
556	1	557	4	Silty claystone	1	3	
557	4	589	0	Siltstone, shaly in places and sandy in the lower part	31	8	
589	0	615	0	Shaly siltstone with scattered ferruginous concretions	26	0	
615	0	620	0	Shaly claystone	5	0	
620	0	628	6	Shaly claystone with sandy partings; dip 13°	8	6	

Log of core drill hole no. 15-21-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
628	6	634	0	Sandstone and siltstone, mostly thin-bedded	5	6	
634	0	658	4	Sandy thin-bedded siltstone	24	4	
658	4	658	5	Coal	0	1	
658	5	661	6	Carbonaceous claystone	3	1	
661	6	670	8	Thin-bedded siltstone with shaly partings	9	2	
670	8	679	8	Thin-bedded sandstone and siltstone	9	0	
679	8	700	2	Shaly siltstone	20	6	
700	2	712	0	Sandy siltstone	11	10	
712	0	757	0	Shaly and silty claystone with scattered ferruginous lenses	45	0	
757	0	761	0	Sandstone with scattered pellets of claystone	4	0	
761	0	804	4	Clayey siltstone with sandy lenses and partings from a fraction to 2 inches thick	43	4	
804	4	805	2	Coal (5″ core recovered)	0	10	) Gann coal bed
805	2	805	6	Claystone	0	4	
805	6	808	6	Siltstone	3	0	
808	6	816	0	Siltstone and shale in bands ranging from 3″ thick in lower part to ¼″ thick in upper part	7	6	
816	0	822	2	Siltstone grading into claystone	6	2	
822	2	823	2	Coal (10″ core recovered)	1	0	) Higginbotham coal bed
823	2	824	6	Coaly claystone	1	4	
824	6	825	3	Carbonaceous claystone	0	9	
825	3	829	0	Claystone	3	9	
829	0	842	4	Siltstone and claystone	13	4	
842	4	874	0	Sandstone	31	8	
874	0	876	4	Claystone conglomerate, sand matrix; streak of coal at base	2	4	
876	4	883	6	Sandstone with scattered pellets of claystone and coal streaks	7	2	
883	6	885	0	Slickensided claystone	1	6	
885	0	889	0	Claystone conglomerate	4	0	
889	0	896	0	Shaly claystone	7	0	
896	0	896	11	Claystone	0	11	
896	11	898	0	Coal (6″ core recovered)	1	1	) Fairview coal bed
898	0	898	4	Coaly claystone	0	4	
898	4	898	9	Coal	0	5	
898	9	899	1	Claystone	0	4	
899	1	900	6	Coal (14″ core recovered)	1	5	
900	6	901	0	Claystone	0	6	
901	0	904	0	Carbonaceous claystone with scattered streaks of coal	3	0	

Total depth 904 feet.

Log of core drill hole no. 16-13-CA

Location: 400 feet south and 740 feet east of the northwest corner of sec. 13, T. 16 S., R. 3 E.

Altitude: 610 feet.

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
0	0	30	0	Soil and weathered rock	30	0	
30	0	32	0	Fine-grained carbonaceous sandstone	2	0	
32	0	46	0	Siltstone	14	0	
46	0	46	10	Claystone with plant fossils	0	10	
46	10	47	4	Siltstone	0	6	
47	0	47	11	Claystone with streaks of coal containing pyrite	0	7	
47	11	48	3	Bright coal	0	4	Hammond coal bed
48	3	48	7	Claystone with streaks of coal	0	4	Hammond coal bed
48	7	48	9	Coal and claystone	0	2	Hammond coal bed
48	9	49	5	Claystone with streaks of coal	0	8	
49	5	55	6	Claystone; many plant fossils	6	1	
55	6	56	0	Carbonaceous siltstone	0	6	
56	0	56	10	Silty claystone	0	10	
56	10	57	9	Bright coal	0	11	Brewer coal bed
57	9	57	11	Coaly claystone	0	2	Brewer coal bed
57	11	58	3	Carbonaceous claystone	0	4	Brewer coal bed
58	3	70	0	Micaceous siltstone; in places sandy or clayey	11	9	
70	0	71	0	Very fine-grained sandstone	1	0	
71	0	93	0	Siltstone and carbonaceous claystone	22	0	
93	0	94	2	Claystone; strata horizontal	1	2	
94	2	95	8	Siltstone and sandstone with pyrite	1	6	
95	8	100	0	Carbonaceous silty claystone	4	4	
100	0	106	0	Claystone and siltstone	6	0	
106	0	126	0	Claystone with streaks of coal; scattered ferruginous concretions	20	0	
126	0	141	7	Carbonaceous claystone with ferruginous concretions and numerous streaks of coal	15	7	
141	7	144	7	Sandy siltstone	3	0	
144	7	149	9	Carbonaceous sandstone	5	2	
149	9	156	4	Clayey siltstone	6	7	
156	4	169	0	Silty claystone	12	8	
169	0	170	0	Sandstone	1	0	
170	0	179	10	Sandstone and siltstone	9	10	
179	10	189	0	Fine-grained micaceous sandstone grading into siltstone	9	2	
189	0	191	2	Claystone; streaks of coal	2	2	
191	2	193	0	Bright coal	1	10	Coal City coal bed
193	0	193	1	Claystone	0	1	Coal City coal bed
193	1	193	5	Clayey coal	0	4	Coal City coal bed
193	5	193	11	Claystone	0	6	
193	11	195	6	Carbonaceous slickensided claystone	1	7	
195	6	195	10	Claystone with streaks of coal	0	4	
195	10	195	10½	Bone	0	0½	

Log of core drill hole no. 16-13-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
195	10½	196	0	Coal	0	1½	
196	0	196	5	Coaly claystone with streaks of coal	0	5	
196	5	198	5	Carbonaceous claystone	2	0	
198	5	198	9	Coal with streaks of bone	0	4	
198	9	208	6	Carbonaceous claystone with streaks of coal; 2" coaly clay from 205' 7"-205' 9"	9	9	
208	6	210	6	Carbonaceous slickensided claystone with streaks of coal	2	0	
210	6	216	2	Carbonaceous claystone	5	8	
216	2	216	8	Coaly claystone with streaks of coal	0	6	
216	8	219	0	Carbonaceous claystone	2	4	
219	0	219	10	Coal with streaks of clay	0	10	) Inman coal bed
219	10	220	4	Slightly carbonaceous claystone	0	6	
220	4	223	0	Claystone	2	8	
223	0	223	4	Coal	0	4	
223	4	223	6	Claystone	0	2	
223	6	224	6	Coaly claystone	1	0	
224	6	227	6	Claystone with streaks of coal	3	0	
227	6	232	0	Carbonaceous claystone	4	6	
232	0	237	0	Siltstone with plant fossils	5	0	
237	0	257	8	Medium-grained micaceous sandstone	20	8	
257	8	262	0	Siltstone with sandy lenses	4	4	
262	0	275	0	Siltstone	13	0	
275	0	284	2	Fine-grained micaceous sandstone	9	2	
284	2	287	10	Sandy siltstone	3	8	
287	10	296	0	Siltstone	8	2	
296	0	301	0	Silty claystone	5	0	
301	0	334	0	Siltstone, thin-bedded with sandy streaks and ferruginous concretions in upper part	33	0	
334	0	335	6	Carbonaceous claystone	1	6	
335	6	350	0	Clayey and sandy siltstone	14	6	
350	0	360	0	Slightly carbonaceous claystone	10	0	
360	0	360	1½	Coaly claystone	0	1½	
360	1½	360	3½	Coal	0	2	}
360	3½	360	6½	Coaly claystone	0	3	
360	6½	360	8	Coal	0	1½	
360	8	360	9	Bone	0	1	
360	9	361	6	Bright coal	0	9	
361	6	361	8	Coaly claystone	0	2	
361	8	362	2	Claystone with streaks of coal	0	6	} Broken Arrow
362	2	362	5	Coal with streaks of clay	0	3	coal bed
362	5	362	11	Claystone with streaks of coal	0	6	
362	11	363	1	Coaly claystone	0	2	
363	1	363	4	Coal	0	3	
363	4	363	7	Claystone with streaks of coal	0	3	
363	7	363	8½	Coal	0	1½	}

Log of core drill hole no. 16-13-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
363	8½	363	9½	Claystone; streaks of coal	0	1	
363	9½	363	11	Coaly claystone	0	1½	
363	11	371	6	Carbonaceous claystone, shaly, with ferruginous concretions	7	7	
371	6	389	0	Medium-grained sandstone; coal streaks 382′ to 383′ 5″	17	6	
389	0	389	10	Claystone; streaks of coal	0	10	
389	10	392	0	Carbonaceous sandstone	2	2	
392	0	396	8	Fine-grained sandstone	4	8	
396	8	402	4	Claystone and siltstone	5	8	
402	4	429	0	Claystone with scattered ferruginous concretions	26	8	
429	0	429	5	Claystone, coaly streaks	0	5	
429	5	429	8	Coal and coaly claystone	0	3	
429	8	430	6	Claystone; streaks of coal	0	10	
430	6	430	8	Coaly claystone	0	2	
430	8	431	2	Coal (5″ core recovered)	0	6	
431	2	431	6	Coaly claystone	0	4	
431	6	431	9	Claystone	0	3	
431	9	431	11	Coaly claystone	0	2	
431	11	432	5	Fine-grained sandstone	0	6	
432	5	445	0	Sandy siltstone	12	7	
445	0	468	6	Clayey siltstone	23	6	
468	6	470	9	Carbonaceous claystone	2	3	
470	9	471	0	Coal; streaks of clay (2″ core recovered)	0	3	Marion coal bed
471	0	471	11	Claystone with streaks of coal and pyrite	0	11	Marion coal bed
471	11	473	6	Coal; streaks of pyrite in upper 3″	1	7	Marion coal bed
473	6	474	7	Carbonaceous claystone	1	1	Marion coal bed
474	7	474	10	Coal	0	3	Marion coal bed
474	10	474	11	Coaly slickensided claystone	0	1	
474	11	475	2	Claystone	0	3	
475	2	475	6	Coaly slickensided claystone	0	4	
475	6	475	11	Claystone	0	5	
475	11	484	6	Clayey siltstone; plant fossils	8	7	
484	6	509	11	Fine- to medium-grained micaceous sandstone	25	5	
509	11	510	0	Bone	0	1	
510	0	510	4	Coal	0	4	
510	4	515	6	Claystone with coal streaks and scattered ferruginous concretions	5	2	
515	6	522	2	Claystone with many plant fossils and streaks of coal in lower part	6	8	
522	2	522	5	Coal	0	3	
522	5	522	10	Slickensided coaly claystone	0	5	
522	10	523	0	Coal	0	2	
523	0	523	4½	Coaly claystone	0	4½	
523	4½	523	6½	Coal	0	2	
523	6½	523	9	Claystone	0	2½	
523	9	523	11½	Bone	0	2½	

Log of core drill hole no. 16-13-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
523	11½	524	3	Hard coaly claystone	0	3½	
524	3	529	6	Silty claystone	5	3	
529	6	538	0	Siltstone	8	6	
538	0	599	6	Medium-grained sandstone; scattered shale partings and carbonaceous	61	6	
599	6	602	6	Siltstone	3	0	
602	6	616	0	Sandstone with coal streaks	13	6	
616	0	621	0	Siltstone	5	0	
621	0	623	0	Fine-grained thin-bedded sandstone	2	0	
623	0	626	4	Siltstone	3	4	
626	4	627	6	Sandstone	1	2	
627	6	630	9	Carbonaceous siltstone	3	3	
630	9	647	11	Carbonaceous and clayey siltstone with scattered ferruginous concretions	17	2	
647	11	648	3	Coal	0	4	Bibby zone of coal beds
648	3	648	8	Siltstone	0	5	
648	8	659	8	Sandy siltstone with scattered ferruginous concretions	11	0	
659	8	704	9	Shaly claystone with scattered ferruginous concretions and coal streaks	45	1	
704	9	704	11½	Coal with bony streaks	0	2½	
704	11½	706	4	Bright coal	1	4½	
706	4	715	0	Carbonaceous claystone	8	8	
715	0	715	2	Coal	0	2	
715	2	716	3½	Carbonaceous claystone with streaks of coal	1	1½	
716	3½	716	6	Coal	0	2½	
716	6	717	0	Claystone	0	6	
717	0	718	6	Siltstone	1	6	
718	6	720	6	Claystone, plant fossils	2	0	
720	6	730	0	Thin-bedded sandy siltstone	9	6	
730	0	733	1	Silty and shaly claystone	3	1	
733	1	733	6	Claystone	0	5	
733	6	733	11	Slickensided coaly claystone	0	5	
733	11	734	10½	Claystone	0	11½	
734	10½	735	3½	Slickensided coaly claystone	0	5	
735	3½	735	7½	Claystone	0	4	
735	7½	737	0	Siltstone, many plant fossils	1	4½	
737	0	742	3½	Claystone	5	3½	
742	3½	748	0	Sandy siltstone	5	8½	
748	0	763	0	Carbonaceous shaly claystone with ankerite spherules	15	0	
763	0	773	0	Claystone and siltstone	10	0	
773	0	775	6	Fine-grained sandstone	2	6	
775	6	789	0	Siltstone and claystone	13	6	
789	0	820	5	Medium-grained sandstone with pellets of claystone and streaks of coal	31	5	
820	5	856	0	Thick-bedded sandstone	35	7	
856	0	871	0	Thin-bedded claystone with many thin lenticular sandy partings	15	0	
871	0	893	8	Shaly claystone with scattered thin sandy partings	22	8	

Log of core drill hole no. 16-13-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
893	8	894	1	Claystone	0	5	
894	1	895	0	Coal with streaks of bone	0	11	) Brown coal bed
895	0	896	4	Claystone	1	4	
896	4	898	4	Siltstone	2	0	
898	4	901	0	Sandstone	2	8	
901	0	915	0	Thin-bedded siltstone and sandstone	14	0	
915	0	949	0	Silty and shaly claystone with scattered ferruginous concretions	34	0	
949	0	956	0	Sandstone	7	0	
956	0	997	0	Shaly siltstone with scattered ferruginous concretions and streaks of coal	41	0	
997	0	999	0	Light-gray siltstone	2	0	
999	0	1012	9	Fine-grained micaceous sandstone; dip 5°	13	9	
1012	9	1018	0	Thin-bedded sandstone and siltstone	5	3	
1018	0	1028	0	Shaly siltstone	10	0	
1028	0	1062	0	Siltstone with scattered sandy partings and ferruginous concretions	34	0	
1062	0	1075	0	Silty shaly claystone with scattered ferruginous concretions	13	0	
1075	0	1106	0	Thin-bedded siltstone with sandy partings; ferruginous concretions in lower part	31	0	
1106	0	1119	9	Carbonaceous claystone	13	9	
1119	9	1124	9	Medium-grained sandstone with pellets of claystone	5	0	
1124	9	1126	9	Claystone and sandstone	2	0	
1126	9	1151	3	Shaly claystone with sandy partings and ferruginous concretions	24	6	
1151	3	1151	6	Claystone	0	3	
1151	6	1152	5	Coal (1½" core recovered)	0	11	) Gann coal bed
1152	5	1152	8	Siltstone	0	3	
1152	8	1159	1	Fine-grained thin-bedded sandstone	6	5	
1159	1	1167	3	Claystone	8	2	
1167	3	1171	11	Siltstone and claystone in thin gradational bands	4	8	
1171	11	1172	3	Claystone	0	4	
1172	3	1172	10	Coal	0	7	) Higginbotham coal bed
1172	10	1173	1	Coaly claystone	0	3	
1173	1	1173	4	Carbonaceous siltstone	0	3	
1173	4	1175	3	Carbonaceous siltstone grades into claystone; many pyrite-bearing nodules of ankerite	1	11	
1175	3	1177	1	Siltstone and claystone	1	10	
1177	1	1182	6	Sandstone and siltstone	5	5	
1182	6	1201	6	Fine-grained carbonaceous sandstone	19	0	
1201	6	1204	0	Carbonaceous claystone with streaks of coal	2	6	
1204	0	1204	3	Claystone	0	3	

Log of core drill hole no. 16-13-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
1204	3	1205	10	Bright coal (16" core recovered)	1	7	
1205	10	1206	3	Claystone	0	5	
1206	3	1211	3	Claystone; many plant fossils	5	0	
1211	3	1236	1	Thin-bedded claystone and siltstone	24	10	
1236	1	1236	5	Claystone	0	4	
1236	5	1236	9	Coal	0	4	Fairview coal bed
1236	9	1236	9½	Bone	0	0½	
1236	9½	1237	5	Coal	0	7½	
1237	5	1237	7	Coaly claystone	0	2	
1237	7	1237	11	Carbonaceous claystone	0	4	
1237	11	1238	2	Coaly claystone	0	3	
1238	2	1241	9	Carbonaceous claystone	3	7	
1241	9	1241	11	Slickensided claystone	0	2	
1241	11	1242	0½	Coal	0	1½	
1242	0½	1242	2½	Coaly claystone	0	2	
1242	2½	1243	2	Coal	0	11½	
1243	2	1243	6	Claystone	0	4	
1243	6	1247	4	Carbonaceous slickensided claystone	3	10	
1247	4	1255	2	Siltstone	7	10	
1255	2	1259	6	Fine-grained cross-bedded sandstone	4	4	
1259	6	1265	0	Siltstone with sandy partings	5	6	

Total depth 1,265 feet.

Log of core drill hole no. 17-1-CA

Location: 400 feet north and 700 feet west of the southeast corner of sec. 1, T. 16 S., R. 3 E.

Altitude: 590 feet.

0	0	17	0	Soil and weathered rock	17	0	
17	0	18	6	Siltstone	1	6	
18	6	21	0	Thin-bedded sandstone	2	6	
21	0	34	0	Micaceous siltstone	13	0	
34	0	53	10	Silty and micaceous siltstone with scattered sandy partings	19	10	
53	10	56	4	Claystone with streaks of coal	2	6	
56	4	58	0	Slickensided claystone	1	8	
58	0	63	0	Fine siltstone	5	0	
63	0	96	0	Claystone	33	0	
96	0	100	0	Siltstone	4	0	
100	0	115	4	Cross-bedded silty micaceous sandstone	15	4	
115	4	120	2	Claystone	4	10	
120	2	125	6	Sandstone	5	4	
125	6	133	0	Siltstone with sandstone beds	7	6	
133	0	137	9	Medium-grained sandstone	4	9	
137	9	140	2	Carbonaceous claystone	2	5	
140	2	147	4	Shaly siltstone; dip 10°	7	2	
147	4	148	10	Sandstone	1	6	
148	10	162	3	Claystone	13	5	
162	3	166	6	Siltstone	4	3	
166	6	179	9	Carbonaceous claystone	13	3	
179	9	181	1	Coaly claystone	1	4	
181	1	184	8	Coal	3	7	Coal City coal bed

Log of core drill hole no. 17-1-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
184	8	185	4	Siltstone	0	8	
185	4	188	0	Siltstone and sandstone	2	8	
188	0	192	1	Sandstone	4	1	
192	1	196	4	Sandstone and siltstone	4	3	
196	4	204	0	Thin-bedded siltstone with sandy partings	7	8	
204	0	212	9	Medium-grained sandstone	8	9	
212	9	216	1	Thin-bedded siltstone with sandy partings; dip 10°	3	4	
216	1	228	0	Clayey siltstone; dip 12o-15o	11	11	
228	0	232	6	Carbonaceous claystone	4	6	
232	6	240	6	Siltstone	8	0	
240	6	247	0	Shaly claystone with ferruginous concretions; dip 15°	6	6	
247	0	248	0	Siltstone	1	0	
248	0	251	7	Slickensided carbonaceous claystone	3	7	
251	7	255	7	Sandstone and siltstone	4	0	
255	7	258	0	Carbonaceous claystone	2	5	
258	0	265	0	Siltstone	7	0	
265	0	274	0	Carbonaceous claystone	9	0	
274	0	274	7	Coal and coaly claystone (4" core recovered)	0	7	Inman coal bed
274	7	274	8	Claystone	0	1	Inman coal bed
274	8	274	10	Bony coal (1" core recovered)	0	2	Inman coal bed
274	10	275	4	Carbonaceous claystone	0	6	
275	4	275	5	Coaly claystone	0	1	
275	5	275	8	Claystone	0	3	
275	8	276	4	Claystone with streaks of coal	0	8	
276	4	276	8	Carbonaceous claystone	0	4	
276	8	283	10	Silty claystone	7	2	
283	10	286	4	Claystone with sandy lenticular partings	2	6	
286	4	335	0	Siltstone	48	8	
335	0	358	0	Silty claystone	23	0	
358	0	391	0	Shaly claystone with scattered ferruginous concretions	33	0	
391	0	409	0	Silty claystone	18	0	
409	0	417	6	Claystone; dip 14°	8	6	
417	6	417	8	Coal	0	2	
417	8	423	0	Siltstone	5	4	
423	0	425	6	Claystone	2	6	
425	6	425	9	Coal	0	3	
425	9	426	1	Claystone	0	4	
426	1	427	7	Slickensided claystone	1	6	
427	7	430	0	Siltstone and claystone	2	5	
430	0	437	3	Sandy cross-bedded siltstone	7	3	
437	3	444	0	Siltstone and claystone	6	9	
444	0	449	0	Fine-grained sandstone with silty partings	5	0	
449	0	450	0	Silty claystone	1	0	
450	0	453	0	Siltstone	3	0	
453	0	454	0	Claystone	1	0	
454	0	548	0	Siltstone	4	0	
458	0	470	8	Fine-grained cross-bedded sandstone with beds of claystone 6" thick	12	8	

Log of core drill hole no. 17-1-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
470	8	478	0	Siltstone grading into sandstone	7	4	
478	0	481	1	Carbonaceous claystone	3	1	
481	1	481	8	Coal (3" core recovered)	0	7	Broken Arrow coal bed
481	8	482	1	Claystone; streaks of coal	0	5	
482	1	482	7	Coaly claystone	0	6	
482	7	485	3	Coal (27" core recovered)	2	8	
485	3	487	1	Claystone with plant fossils	1	10	
487	1	498	7	Claystone with scattered ferruginous concretions	11	6	
498	7	503	6	Siltstone	4	11	
503	6	512	8	Silty claystone	9	2	
512	8	520	2	Carbonaceous claystone with streaks of coal	7	6	
520	2	520	5	Coal	0	3	
520	5	520	8	Claystone	0	3	
520	8	520	11	Coal and bone	0	3	
520	11	521	2	Claystone with streaks of coal	0	3	
521	2	521	5	Claystone	0	3	
521	5	521	8	Bony coal	0	3	
521	8	522	0	Claystone	0	4	
522	0	522	7	Claystone and coal	0	7	
522	7	523	6	Claystone	0	11	
523	6	523	10	Bony coal	0	4	
523	10	524	4	Claystone with streaks of coal	0	6	
524	4	524	6	Bony coal	0	2	
524	6	525	4	Claystone with streaks of coal	0	10	
525	4	525	8	Bony coal	0	4	
525	8	526	8	Claystone with streaks of coal	1	0	
526	8	531	0	Claystone	4	4	
531	0	533	0	Siltstone	2	0	
533	0	537	8	Claystone	4	8	
537	8	539	0	Siltstone	1	4	
539	0	549	0	Silty micaceous sandstone	10	6	
549	6	563	7	Sandy cross-bedded siltstone	14	1	
563	7	563	9½	Coal	0	2½	Marion coal bed
563	9½	563	10	Claystone	0	0½	
563	10	565	7	Bright coal	1	9	
565	7	565	8	Coaly claystone	0	1	
565	8	567	8	Claystone with scattered streaks of coal	2	0	
567	8	568	2	Coal	0	6	
568	2	569	2	Claystone	1	0	
569	2	569	7	Coaly claystone	0	5	
569	7	570	6	Carbonaceous claystone	0	11	
570	6	575	6	Siltstone	5	0	
575	6	580	0	Fine-grained silty sandstone	4	6	
580	0	593	0	Medium- to coarse-grained thick-bedded sandstone	13	0	
593	0	593	8	Sandstone; streaks of coal	0	8	
593	8	610	0	Medium-grained sandstone	16	4	
610	0	612	0	Sandstone; streaks of coal	2	0	
612	0	614	6	Sandstone; pellets of claystone	2	6	
614	6	620	8	Thin-bedded sandy siltstone	6	2	
620	8	620	10	Slickensided carbonaceous claystone	0	2	
620	10	621	4	Claystone	0	6	

Log of core drill hole no. 17-1-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
621	4	622	2	Slickensided carbonaceous claystone	0	10	
622	2	622	5	Siltstone	0	3	
622	5	622	6	Coaly claystone	0	1	
622	6	624	0	Claystone	1	6	
624	0	624	8	Coaly claystone	0	8	
624	8	626	9	Carbonaceous sandy claystone	2	1	
626	9	626	11	Coaly claystone	0	2	
626	11	627	8	Carbonaceous claystone with streaks of coal	0	9	
627	8	635	0	Claystone	7	4	
635	0	643	3	Clayey siltstone	8	3	
643	3	648	3	Silty cross-bedded sandstone	5	0	
648	3	677	3	Thick-bedded sandstone with thin conglomerate at bottom	29	0	
677	3	678	9	Thin-bedded sandstone and siltstone	1	6	
678	9	680	3	Claystone	1	6	
680	3	681	7	Siltstone	1	4	
681	7	686	3	Silicinate sandstone	4	8	
686	3	691	3	Sandy siltstone	5	0	
691	3	703	6	Shaly and silty claystone; dip 7°	12	3	
703	6	711	0	Claystone; scattered sandy partings and ferruginous lenses	7	6	
711	6	724	3	Claystone with scattered sandy partings	13	3	
724	3	753	0	Shaly siltstone with lenticular sandy partings and ferruginous concretions	28	9	
753	0	765	3	Sandy claystone with ferruginous concretions; dip 10°	12	3	
765	3	765	8	Slickensided carbonaceous claystone	0	5	
765	8	766	6	Coal (8" core recovered)	0	10	
766	6	773	10	Slickensided carbonaceous claystone with streaks of coal	7	4	
773	10	779	0	Claystone with ankerite nodules	5	2	
779	0	789	6	Thick-bedded clayey siltstone	10	6	
789	6	804	0	Siltstone grading into sandstone	14	6	
804	0	824	3	Thin-bedded sandstone	20	3	
824	3	828	10	Slickensided carbonaceous claystone with streaks of coal	4	7	
828	10	829	2	Coal	0	4	
829	2	832	7	Silty claystone with many plant fossils	3	5	
832	7	832	11	Claystone	0	4	Bibby zone of coal beds
832	11	833	6	Coal	0	7	
833	6	833	8	Coaly claystone	0	2	
833	8	834	1	Claystone	0	5	
834	1	836	7	Sandstone	2	6	
836	7	842	9	Slickensided claystone; dip 27°	6	2	
842	9	843	3	Claystone	0	6	
843	3	843	7	Claystone with streaks of coal	0	4	
843	7	843	11	Claystone	0	4	
843	11	844	3	Slickensided carbonaceous claystone	0	4	
844	3	845	0	Carbonaceous claystone	0	9	
845	0	845	6	Claystone with streaks of coal	0	6	
845	6	846	2	Carbonaceous claystone	0	8	
846	2	847	4	Coal; dip 10°	1	2	

Log of core drill hole no. 17-1-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.
847	4	861	9	Claystone with many plant fossils	14	5
861	9	865	9	Fine-grained cross-bedded sandstone	4	0
865	9	889	9	Medium-grained thick-bedded sandstone	24	0
889	9	890	6	Sandstone with carbonized plant fragments	0	9
890	6	894	2	Carbonaceous claystone with ankerite nodules	3	8
894	2	906	0	Fine-grained cross-bedded sandstone and siltstone	11	10
906	0	915	0	Silty and clayey siltstone; dip 15°	9	0
915	0	946	8	Silicinate sandstone with scattered carbonaceous zones	31	8
946	8	960	0	Sandy siltstone	13	4
960	0	966	0	Sandstone	6	0
966	0	977	0	Sandstone and siltstone	11	0
977	0	986	0	Sandstone	9	0
986	0	988	0	Claystone with coal streaks	2	0
988	0	991	6	Siltstone	3	6
991	6	992	6	Sandstone	1	0
992	6	1011	4	Shaly claystone with scattered sandy partings and ferruginous concretions	18	10
1011	4	1011	10	Claystone with streaks of coal	0	6
1011	10	1014	0	Claystone	2	2
1014	0	1023	0	Siltstone	9	0
1023	0	1041	0	Shaly claystone with coal streaks in bottom, silty in the middle	18	0
1041	0	1053	0	Medium-grained thick-bedded sandstone	12	0
1053	0	1065	6	Shaly claystone with ferruginous concretions	12	6
1065	6	1066	0	Carbonaceous claystone	0	6
1066	0	1066	3	Coal	0	3
1066	3	1066	5	Claystone	0	2
1066	5	1069	9	Claystone grading into siltstone	3	4
1069	9	1081	8	Siltstone with sandy partings	11	11
1081	8	1083	5	Claystone with streaks of coal	1	9
1083	5	1083	8	Coal	0	3
1083	8	1085	2	Slickensided coaly claystone	1	6
1085	2	1088	0	Claystone	2	10
1088	0	1099	6	Thin-bedded lenticular sandstone and siltstone	11	6
1099	6	1102	0	Sandstone	2	6
1102	0	1103	1	Claystone	1	1
1103	1	1103	11	Slickensided carbonaceous claystone	0	10
1103	11	1104	9	Coaly claystone	0	10
1104	9	1105	2	Slickensided carbonaceous claystone	0	5
1105	2	1108	4	Claystone	3	2
1108	4	1111	10	Siltstone and claystone	3	6
1111	10	1123	4	Claystone	11	6
1123	4	1127	10	Sandstone and silty claystone	4	6
1127	10	1130	8	Carbonaceous claystone	2	10
1130	8	1134	0	Cross-bedded sandstone	3	4
1134	0	1145	6	Siltstone	11	6

Log of core drill hole no. 17-1-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
1145	6	1146	6	Cross-bedded sandstone	1	0	
1146	6	1154	6	Clayey siltstone	8	0	
1154	6	1185	4	Medium-grained sandstone with fragments of carbonized plants	30	10	
1185	4	1186	0	Siltstone	0	8	
1186	0	1202	2	Sandstone with streaks of coal; pellets of claystone in base	16	2	
1202	2	1206	9	Silty claystone	4	7	
1206	9	1210	9	Siltstone with sandy partings	4	0	
1210	9	1213	0	Thin-bedded sandstone with shaly partings	2	3	
1213	0	1221	6	Siltstone with sandy partings	8	6	
1221	6	1239	5	Silty claystone	17	11	
1239	5	1239	9	Coal	0	4	) Gann coal bed
1239	9	1242	8	Siltstone	2	11	
1242	8	1257	0	Sandstone with slickensided shaly partings	14	4	
1257	0	1268	10	Claystone and siltstone	11	10	
1268	10	1286	3	Slickensided claystone with many calcite veins in partings	17	5	
1286	3	1294	3	Claystone with sandy lenticular partings; dip 35°	8	0	
1294	3	1311	0	Siltstone with sandy lenticular partings; dip 30°	16	9	
1311	0	1317	0	Thin-bedded silty sandstone	6	0	
1317	0	1324	6	Slickensided silty claystone with sandy lenticular partings; dip 50°	7	6	
1324	6	1325	0	Sandstone	0	6	
1325	0	1328	6	Slickensided claystone	3	6	
1328	6	1331	0	Fine-grained thin-bedded sandstone; dip 35°	2	6	
1331	0	1332	6	Claystone	1	6	
1332	6	1347	0	Sandy siltstone; dip 50°	14	6	
1347	0	1347	9	Coal	0	9	)
1347	9	1348	3	Claystone with streaks of coal	0	6	)
1348	3	1349	2½	Slickensided carbonaceous claystone	0	11½	)
1349	2½	1349	5	Coaly claystone	0	2½	} Fairview
1349	5	1350	1	Coal	0	8	) coal bed
1350	1	1350	3½	Claystone	0	2½	)
1350	3½	1350	9½	Coaly claystone	0	6	)
1350	9½	1352	5	Coal	1	7½	)
1352	5	1354	0	Slickensided carbonaceous claystone	1	7	
1354	0	1355	0	Claystone	1	0	
1355	0	1378	0	Siltstone with sandy partings; dip 45°	23	0	

Total depth 1,378 feet.

Log of core drill hole no. 18-1-CA

Location: 2,180 feet north and 600 feet east of the southwest corner of sec. 1, T. 16 S., R. 3 E.

Altitude: 565 feet.

0	0	14	0	Surface and weathered rock	14	0
14	0	35	10	Claystone with ferruginous concretions near top	21	10
35	10	40	0	Fine-grained cross-bedded sandstone	4	2

Log of core drill ho'e no. 18-1-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
40	0	42	3	Siltstone	2	3	
42	3	45	8	Claystone	3	5	
45	8	55	3	Sandy siltstone	9	7	
55	3	61	9	Thin-bedded sandstone with silty carbonaceous partings; dip 23°	6	6	
61	9	62	1	Siltstone; dip 20°	0	4	
62	1	63	3	Carbonaceous sandstone	1	2	
63	3	76	10	Medium-grained sandstone	13	7	
76	10	79	6	Claystone and siltstone with streaks of coal	2	8	
79	6	85	11	Claystone with many plant fossils and scattered ferruginous concretions; dip 11°	6	5	
85	11	86	5	Coal	0	6	Broken Arrow coal bed
86	5	86	7	Coaly slickensided claystone	0	2	
86	7	86	8	Coal	0	1	
86	8	86	11	Bone coal	0	3	
86	11	88	2	Coal (8″ core recovered)	1	3	
88	2	94	0	Claystone	5	10	
94	0	103	9	Sandy siltstone	9	9	
103	9	106	3	Claystone	2	6	
106	3	110	7	Sandstone and siltstone	4	4	
110	7	118	6	Claystone with ferruginous concretions	7	11	
118	6	120	0	Siltstone	1	6	
120	0	133	9	Claystone with many plant fossils	13	9	
133	9	135	7	Silty claystone	1	10	
135	7	142	2	Carbonaceous claystone	6	7	
142	2	142	9	Claystone	0	7	
142	9	143	1	Coal	0	4	
143	1	143	3	Claystone	0	2	
143	3	143	8	Bone coal	0	5	
143	8	143	11	Carbonaceous claystone	0	3	
143	11	144	2	Claystone with streaks of coal	0	3	
144	2	144	4	Claystone	0	2	
144	4	144	8	Claystone with streaks of coal	0	4	
144	8	144	10	Coal	0	2	
144	10	145	9	Carbonaceous claystone	0	11	
145	9	145	11	Coal	0	2	
145	11	147	1	Carbonaceous claystone	1	2	
147	1	147	7	Slickensided claystone	0	6	
147	7	147	11	Carbonaceous claystone	0	4	
147	11	148	0	Bony coal	0	1	
148	0	150	0	Carbonaceous claystone	2	0	
150	0	153	0	Sandy siltstone	3	0	
153	0	168	6	Claystone with scattered ferruginous concretions	15	6	
168	6	180	0	Siltstone	11	6	
180	0	180	3	Claystone	0	3	
180	3	180	7	Coal (no core recovered)	0	4	Marion coal bed
180	7	180	10	Coaly claystone	0	3	
180	10	182	1	Coal	1	3	
182	1	182	2	Coaly claystone	0	1	
182	2	184	3	Claystone with streaks of coal	2	1	
184	3	184	4	Coal	0	1	
184	4	186	0	Carbonaceous claystone	1	8	

Total depth 186 feet.

Log of core drill hole no. 19-6-CA

Location: 1,000 feet south and 750 feet east of northwest corner of sec. 6, T. 16 S., R 4 E.

Altitude: 510 feet.

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
0	0	9	0	Soil and weathered rock	9	0	
9	0	11	6	Carbonaceous claystone	2	6	
11	6	14	6	Sandstone	3	0	
14	6	20	6	Claystone	6	0	
20	6	30	7	Carbonaceous claystone	10	1	
30	7	31	5	Coal (no core recovered)	0	10	
31	5	31	7	Clay	0	2	
31	7	33	0	Bony coal (no core recovered)	1	5	
33	0	35	10	Siltstone	2	10	
35	10	38	4	Claystone with ankerite nodules	2	6	
38	4	43	1	Siltstone	4	9	
43	1	45	1	Claystone	2	0	
45	1	51	0	Carbonaceous claystone	5	11	
51	0	56	0	Claystone with ankerite spherules and nodules	5	0	
56	0	63	6	Claystone	7	6	
63	6	66	5	Siltstone	2	11	
66	5	76	5	Thin-bedded sandstone with ferruginous concretions	10	0	
76	5	85	1	Clayey siltstone	8	8	
85	1	110	0	Sandy siltstone with ferruginous concretions	24	11	
110	0	113	3	Thin-bedded sandstone with silty partings	3	3	
113	3	119	0	Silty claystone with ferruginous concretions	5	9	
119	0	121	0	Sandy siltstone	2	0	
121	0	126	0	Siltstone and sandstone	5	0	
126	0	132	0	Silty sandstone	6	0	
132	0	133	0	Sandy siltstone	1	0	
133	0	180	9	Silty and sandy claystone with scattered ferruginous concretions	47	9	
180	9	192	0	Sandstone	11	3	
192	0	200	5	Claystone with ferruginous concretions	8	5	
200	5	201	3	Coal (2″ core recovered)	0	10	Bibby zone of coal beds
201	3	207	2	Sandy and clayey siltstone in cyclic bands	5	11	
207	2	221	0	Silty claystone in cyclic bands; sandy in middle, streaks of coal in bottom	13	10	
221	0	221	0½	Coaly claystone	0	0½	
221	0½	221	11	Coal (2½″ core recovered)	0	10½	
221	11	222	1	Slickensided claystone	0	2	
222	1	222	3	Claystone	0	2	
222	3	222	6	Coal and coaly claystone	0	3	
222	6	223	0	Coaly claystone	0	6	
223	0	228	0	Silty claystone	5	0	
228	0	234	0	Thin-bedded siltstone with clayey partings	6	0	
234	0	236	0	Claystone	2	0	
236	0	245	4	Thin-bedded sandstone	9	4	
245	4	256	4	Carbonaceous silty claystone	11	0	
256	4	258	10	Sandstone	2	6	
258	10	272	2	Slickensided claystone	13	4	
272	2	278	8	Claystone and siltstone	6	6	
278	8	280	8	Carbonaceous claystone	2	0	
280	8	281	0	Slickensided claystone	0	4	
281	0	282	4	Claystone	1	4	
282	4	282	8	Coal	0	4	

See last page

Log of core drill hole no. 19-6-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
282	8	289	4	Sandy slickensided siltstone with coaly streaks; dip 20°	6	8	
289	4	318	2	Medium-grained sandstone with carbonized plant fragments; dip 12°	28	10	
318	2	321	5	Silty claystone	3	3	
321	5	324	8	Siltstone and sandstone	3	3	
324	8	336	6	Thick-bedded sandstone	11	10	
336	6	340	0	Sandstone with scattered carbonized plant fossils	3	6	
340	0	352	0	Micaceous sandstone; dip 12°	12	0	
352	0	368	4	Shaly siltstone with lenticular sandy partings	16	4	
368	4	379	8	Silty and shaly claystone with sandy partings	11	4	
379	8	380	7	Coal (3″ core recovered)	0	11	) Brown coal bed
380	7	382	3	Slickensided carbonaceous claystone	1	8	
382	3	383	3	Siltstone	1	0	
383	3	390	0	Thin-bedded sandstone	6	9	
390	0	438	0	Shaly silty claystone with sandy partings	48	0	
438	0	447	0	Claystone with coal streaks in upper part	9	0	
447	0	452	0	Sandy siltstone	5	0	
452	0	467	0	Silty claystone with many plant fossils	15	0	
467	0	472	9	Sandstone	5	9	
472	9	482	0	Sandstone and siltstone	9	3	
482	0	486	6	Sandstone	4	6	
486	6	496	0	Siltstone	9	6	
496	0	512	2	Silty claystone	16	2	
512	2	527	6	Shaly siltstone; dip 10°	15	4	
527	6	547	0	Silty claystone with scattered ferruginous concretions	19	6	
547	0	571	0	Shaly siltstone with sandy lenticular partings	24	0	
571	0	571	6	Sandstone	0	6	
571	6	600	4	Claystone with sandy bands and lenticular partings	28	10	
600	4	600	7	Sandy siltstone	0	3	
600	7	601	10	Coal (11″ core recovered)	1	3	) Gann coal bed
601	10	602	1	Carbonaceous claystone	0	3	
602	1	607	0	Sandy siltstone	4	11	
607	0	617	10	Shaly siltstone with sandy and clayey partings	10	10	
617	0	618	2	Claystone	0	4	
618	2	618	5	Coal	0	3	) Higginbotham coal bed
618	5	626	6	Slickensided carbonaceous claystone	8	1	
626	6	630	6	Siltstone	4	0	
630	6	651	9	Thin-bedded and cross-bedded sandstone	21	3	
651	9	655	6	Sandstone and slickensided claystone	3	9	
655	6	686	6	Sandstone with carbonized plant fragments in upper part	31	0	
686	6	692	5	Carbonaceous and sandy siltstone	5	11	

Log of core drill hole no. 19-6-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
692	5	696	9½	Medium-grained sandstone	4	4½	
696	9½	697	4	Medium-grained carbonaceous sandstone	0	6½	
697	4	698	5	Coal (6½" core recovered)	1	1	Fairview coal bed
698	5	698	7	Coaly claystone	0	2	
698	7	698	9	Coal and coaly claystone	0	2	
698	9	699	5	Claystone	0	8	
699	5	699	7	Coaly claystone	0	2	
699	7	699	9	Coal	0	2	
699	9	700	2	Carbonaceous claystone with streaks of coal	0	5	
700	2	700	9	Coal (5" core recovered)	0	7	
700	9	701	1	Carbonaceous claystone	0	4	
701	1	707	8	Claystone	6	7	
707	8	710	8	Sandy siltstone	3	0	
710	8	724	0	Siltstone and sandstone in thin lenticular gradational bands	13	4	
				Total depth 724 feet.			

Redrill of hole 19-6-CA — 0 to 36 feet

0	0	11	2	Soil and sandstone	11	2
11	2	30	6	Claystone (10' 2" core recovered)	19	4
30	6	31	4	Coal (no core recovered)	0	10
31	4	31	8	Claystone	0	4
31	8	31	11	Slickensided claystone; streaks of coal	0	3
31	11	32	8	Coaly claystone	0	9
32	8	33	2	Claystone	0	6
33	2	36	0	Sandy siltstone	2	10

Log of core drill hole no. 20-6-CA

Location: 750 feet south and 900 feet west of the northeast corner of sec. 6, T. 16 S., R. 4 E.
Altitude: 535 feet.

0	0	3	0	Soil	3	0
3	0	51	2	Medium-grained thick-bedded sandstone with scattered carbonaceous partings	48	2
51	2	52	2	Carbonaceous claystone	1	0
52	2	52	6	Bony coal	0	4
52	6	52	9	Coaly claystone	0	3
52	9	59	7	Claystone	6	10
59	7	62	7	Siltstone	3	0
62	7	83	8	Gray claystone; silty in places	21	1
83	8	85	0	Claystone with streaks of coal	1	4
85	0	86	7	Claystone with thin bands of coal	1	7
86	7	87	1	Slickensided claystone	0	6
87	1	87	3	Coal	0	2
87	3	87	4½	Bone with pyrite	0	1½
87	4½	88	6	Coal	1	1½
88	6	88	11	Claystone	0	5
88	11	90	4	Carbonaceous claystone	1	5

Marion coal bed

Log of core drill hole no. 20-6-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
90	4	98	6	Slickensided claystone	8	2	
98	6	99	2	Coal (no core recovered)	0	8	
99	2	100	1	Claystone with streaks of coal	0	11	
100	1	103	2	Light-gray claystone with ankerite nodules	3	1	
103	2	119	0	Light-gray claystone	15	10	
119	0	120	4	Claystone with streaks of coal	1	4	
120	4	135	0	Light-gray claystone	14	8	
135	0	137	7	Siltstone	2	7	
137	7	150	7	Shaly claystone with scattered ferruginous concretions and carbonaceous zones	13	0	
150	7	155	7	Claystone with ankerite nodules	5	0	
155	7	159	3	Claystone with ferruginous concretions	3	8	
159	3	163	3	Siltstone	4	0	
163	3	177	9	Fine-grained sandstone with shaly partings	14	6	
177	9	183	0	Siltstone with sandy lenticular partings	5	3	
183	0	200	6	Shaly claystone with thin scattered sandy partings	17	6	
200	6	203	0	Claystone and sandstone	2	6	
203	0	205	0	Sandstone	2	0	
205	0	210	9	Sandy siltstone	5	9	
210	9	212	5	Claystone	1	8	
212	5	218	0	Clayey siltstone with many plant fossils	5	7	
218	0	227	0	Thin-bedded sandstone with shaly partings and scattered ferruginous concretions	9	0	
227	0	234	8	Claystone with thin lenticular sandy partings	7	8	
234	8	265	8	Claystone with ferruginous concretions	31	0	
265	8	267	6	Claystone and siltstone with streaks of coal	1	10	
267	6	279	3	Fine-grained sandstone	11	9	
279	3	281	6	Sandstone and siltstone	2	3	
281	6	295	0	Silty claystone	13	6	
295	0	295	7	Carbonaceous claystone	0	7	
295	7	295	10	Slickensided carbonaceous claystone	0	3	
295	10	296	7	Bright coal	0	9	) Bibby coal bed
296	7	296	11	Siltstone	0	4	
296	11	301	0	Carbonaceous siltstone with many plant fossils	4	1	
301	0	304	0	Silty claystone	3	0	
304	0	312	4	Sandy claystone and siltstone in gradational cyclic bands 2″ thick; dip 15°	8	4	
312	4	313	4	Claystone	1	0	
313	4	313	7	Slickensided claystone with carbonized plant fragments	0	3	
313	7	314	0	Coaly claystone	0	5	

Log of core drill hole no. 20-6-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
314	0	314	10	Claystone with streaks of coal	0	10	
314	10	315	3	Carbonaceous claystone	0	7	
315	5	316	2	Coaly claystone	0	9	
316	2	316	6	Slickensided claystone	0	4	
316	6	325	6	Clayey siltstone with many plant fossils	9	0	
325	6	331	0	Siltstone and claystone; dip 10°	5	6	
331	0	335	0	Silty claystone	4	0	
335	0	335	2	Claystone	0	2	
335	2	335	9	Slickensided claystone with streaks of coal	0	7	
335	9	337	2	Carbonaceous claystone	1	5	
337	2	337	6	Slickensided coaly claystone	0	4	
337	6	339	6	Claystone	2	0	
339	6	348	6	Carbonaceous claystone	9	0	
348	6	352	0	Sandy siltstone	3	6	
352	0	354	2	Carbonaceous claystone	2	2	
354	2	356	4	Sandy siltstone	2	2	
356	4	359	6	Shaly claystone	3	2	
359	6	368	1	Slickensided carbonaceous claystone	8	7	
368	1	374	1	Siltstone	6	0	
374	1	386	7	Claystone	12	6	
386	7	426	0	Sandstone with scattered carbonized fragments and claystone pellets	39	5	
426	0	427	6	Claystone	1	6	
427	6	429	9	Claystone conglomerate	2	3	
429	9	440	0	Medium-grained silicinate sandstone	10	3	
440	0	444	6	Sandy siltstone	4	6	
444	6	452	0	Silty sandstone	7	6	
452	0	465	6	Sandy siltstone	13	6	
465	6	477	4	Carbonaceous shaly claystone with scattered sandy partings	11	10	
477	4	477	6	Claystone	0	2	
477	6	477	9	Coal	0	3	) Brown coal bed
477	9	489	8	Slickensided carbonaceous claystone	11	11	
489	8	498	0	Siltstone and lenticular sandstone	8	4	
498	0	540	0	Clayey and shaly siltstone; dip 15°	42	0	
540	0	541	6	Clayey siltstone with scattered ferruginous partings	1	6	
541	6	545	0	Thin-bedded lenticular sandstone with shale partings	3	6	
545	0	548	0	Silty claystone	3	0	
548	0	553	0	Siltstone with sandy lenticular partings and ferruginous concretions	5	0	
553	0	589	6	Claystone with scattered ferruginous concretions; silty in places	36	6	
589	6	595	0	Fine-grained cross-bedded sandstone; dip 15°	5	6	
595	0	597	6	Sandstone, lenticular with shale partings	2	6	
597	6	599	0	Siltstone	1	6	
599	0	601	6	Fine-grained sandstone	2	6	
601	6	606	6	Sandy siltstone	5	0	
606	6	616	0	Clayey siltstone	9	6	
616	0	636	6	Sandy siltstone; dip 15°	20	6	

Log of core drill hole no. 20-6-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
636	6	648	0	Clayey and shaly siltstone	11	6	
638	0	709	4	Micaceous siltstone with scattered sandy lenticular partings	61	4	
709	4	715	4	Lenticular sandstone and shale	6	0	
715	4	727	4	Claystone with scattered sandy lenticular partings, grading into sandstone; dip 20°	12	0	
727	4	728	4	Sandstone and shale	1	0	
728	4	743	11	Claystone with sandy partings and ferruginous concretions	15	7	
743	11	744	9	Coal (9" core recovered)	0	10	) Gann coal bed
744	9	745	3	Slickensided claystone	0	6	
745	3	748	9	Siltstone and sandstone in thin gradational bands; dip 25°	3	6	
748	9	754	7	Thin-bedded micaceous sandstone with shale partings; dip 25°	5	10	
754	7	762	4	Siltstone with sandy partings	7	9	
762	4	763	5	Bright coal (7" core recovered)	1	1	) Higginbotham coal bed
763	5	768	3	Slickensided carbonaceous claystone	4	10	
768	3	768	9	Slickensided coaly claystone	0	6	
768	9	771	9	Siltstone	3	0	
771	9	776	0	Slickensided carbonaceous claystone	4	3	
776	0	784	0	Siltstone and claystone	8	0	
784	0	787	0	Claystone	3	0	
787	0	788	6	Siltstone	1	6	
788	6	818	0	Medium-grained carbonaceous sandstone	29	6	
818	0	821	0	Claystone conglomerate with carbonized plant fragments	3	0	
821	0	833	0	Medium-grained carbonaceous sandstone	12	0	
833	0	853	0	Fine-grained silicinate sandstone; dip 15°	20	0	
853	0	854	3	Claystone	1	3	
854	3	855	3	Coal (11" core recovered)	1	0	) Fairview coal bed
855	3	855	9	Claystone (3" core recovered)	0	6	
855	9	856	3	Coal (5" core recovered)	0	6	
856	3	857	7	Coaly claystone (3" core recovered)	1	4	
857	7	862	0	Carbonaceous claystone	4	5	
				Total depth 862 feet.			

Log of core drill hole no. 21-16-CA

Location: 100 feet north and 1,300 feet west of the southeast corner of sec. 16, T. 15 S., R. 4 E.
Altitude: 580 feet.

0	0	8	0	Soil and weathered rock	8	0	
8	0	13	0	Fine sandstone	5	0	
13	0	18	0	Sandy micaceous siltstone	5	0	
18	0	21	6	Claystone with plant fossils	3	6	
21	6	24	6	Medium- to fine-grained micaceous sandstone	3	0	

Log of core drill hole no. 21-16-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
24	6	55	5	Medium-grained sandstone with scattered carbonaceous zones and claystone pellets	30	11	
55	5	56	7	Slickensided carbonaceous claystone	1	2	
56	7	58	7	Siltstone	2	0	
58	7	82	8	Medium-grained sandstone with carbonized plant fragments and claystone pellets	24	1	
82	8	83	8	Siltstone breccia in sand matrix	1	0	
83	8	85	0	Sandstone with thin claystone conglomerate at base	1	4	
85	0	86	8	Sandy claystone	1	8	
86	8	128	0	Medium-grained sandstone; dip 10°	41	4	
128	0	129	0	Claystone conglomerate	1	0	
129	0	139	6	Sandstone with scattered plant fragments and claystone pellets	10	6	
139	6	144	2	Claystone conglomerate	4	8	
144	2	150	0	Sandstone with shale partings	5	10	
150	0	153	6	Siltstone and claystone	3	6	
153	6	166	6	Siltstone with sandy lenticular partings	13	0	
166	6	170	6	Sandstone	4	0	
170	6	174	0	Siltstone with sandy lenticular partings	3	6	
174	0	177	0	Claystone	3	0	
177	0	182	6	Sandy claystone with plant fossils	5	6	
182	6	188	0	Siltstone	5	6	
188	0	197	0	Thin-bedded sandstone with shaly and carbonaceous partings	9	0	
197	0	204	0	Siltstone	7	0	
204	0	205	11	Claystone	1	11	
205	11	206	6½	Coal	0	7½	Broken Arrow coal bed
206	6½	207	1	Claystone with streaks of coal	0	6½	
207	1	208	11	Carbonaceous claystone	1	10	
208	11	209	0	Coaly claystone	0	1	
209	0	209	2	Coal	0	2	
209	2	209	2½	Claystone	0	0½	
209	2½	209	3½	Coal	0	1	
209	3½	209	6	Coaly claystone	0	2½	
209	6	210	0	Coal	0	6	
210	0	210	4	Siltstone	0	4	
210	4	256	0	Sandstone	45	8	
256	0	257	6	Claystone conglomerate in sand matrix with fragments of carbonized plants	1	6	
257	6	261	6	Carbonaceous claystone	4	0	
261	6	279	4	Fine-grained sandstone, silty in places	17	10	
279	4	279	7	Claystone	0	3	
279	7	282	7	Sandy siltstone	3	0	
282	7	289	9	Claystone with ferruginous concretions and sandy partings	7	2	
289	9	291	6	Carbonaceous claystone	1	9	
291	6	291	9	Claystone with streaks of coal	0	3	
291	9	294	6	Claystone	2	9	

Log of core drill hole no. 21-16-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
294	6	295	4	Claystone with streaks of coal	0	10	
295	4	295	9	Coaly claystone	0	5	
295	9	296	4	Coal	0	7	) Marion coal bed
296	4	302	4	Claystone	6	0	
302	4	308	0	Siltstone	5	8	
308	0	321	6	Siltstone and claystone	13	6	
321	6	322	3	Slickensided carbonaceous claystone	0	9	
322	3	323	0	Claystone with streaks of coal	0	9	
323	0	327	0	Silty claystone	4	0	
327	0	333	0	Thin-bedded carbonaceous sandstone	6	0	
333	0	343	0	Sandy and shaly siltstone; dip 10°	10	0	
343	0	344	5	Slickensided carbonaceous claystone	1	5	
344	5	345	0	Coal and coaly claystone	0	7	
345	0	346	0	Claystone with streaks of coal	1	0	
346	0	348	3	Claystone	2	3	
348	3	374	8	Thick-bedded medium-grained silicinate sandstone	26	5	
374	8	375	5	Sandstone with carbonized plant fragments	0	9	
375	5	376	6	Sandy siltstone	1	1	
376	6	385	6	Thin-bedded lenticular sandstone with shale partings	9	0	
385	6	392	6	Claystone	7	0	
392	6	406	6	Siltstone with sandy lenticular partings	14	0	
406	6	408	0	Sandstone	1	6	
408	0	411	0	Claystone	3	0	
411	0	415	0	Siltstone	4	0	
415	0	424	0	Silty sandstone	9	0	
424	0	427	6	Siltstone	3	6	
427	6	432	0	Silty sandstone	4	6	
432	0	442	8	Silty carbonaceous claystone	10	8	
442	8	445	4	Silty sandstone	2	8	
445	4	469	3	Silty claystone with streaks of coal	23	11	
469	3	471	0	Siltstone	1	9	
471	0	474	0	Claystone	3	0	
474	0	477	0	Siltstone	3	0	
477	0	489	9	Carbonaceous shaly claystone	12	9	
489	9	490	9	Bright coal	1	0	) Bibby zone coal bed
490	9	491	7	Siltstone with streaks of coal	0	10	
491	7	495	4	Claystone	3	9	
495	4	533	8	Medium-grained thick-bedded sandstone, carbonaceous partings	38	4	
533	8	534	4	Claystone conglomerate with streaks of coal	0	8	
534	4	546	6	Medium-grained thick-bedded sandstone, carbonaceous partings	12	2	
546	6	550	8	Sandstone with many carbonized plant fragments	4	2	
550	8	554	10	Silicinate sandstone with claystone conglomerate at the top	4	2	
554	10	571	6	Sandstone with many thin carbonaceous micaceous partings	16	8	

Log of core drill hole no. 21-16-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
571	6	576	0	Silty claystone	4	6	
576	0	582	6	Carbonaceous claystone with ferruginous concretions	6	6	
582	6	592	6	Sandy siltstone	10	0	
592	6	593	6	Carbonaceous claystone	1	0	
593	6	602	0	Fine-grained cross-bedded sandstone with shale partings	8	6	
602	0	604	6	Sandy siltstone	2	6	
604	6	606	9	Shaly siltstone; dip 5°	2	3	
606	9	614	6	Carbonaceous claystone with streaks of coal	7	9	
614	6	622	0	Claystone (flint clay) with ankerite spherules	7	6	
622	0	637	6	Thin-bedded lenticular sandstone with shale partings	15	6	
637	6	672	0	Siltstone with lenticular sandy partings	34	6	
672	0	676	6	Shaly and silty slickensided claystone	4	6	
676	6	676	11	Coal	0	5	Brown coal bed
676	11	677	4	Claystone	0	5	
677	4	677	4½	Coal	0	0½	
677	4½	677	5	Claystone	0	0½	
677	5	677	9	Coal	0	4	
677	9	678	1	Claystone	0	4	
678	1	681	3	Carbonaceous claystone with ferruginous concretions	3	2	
681	3	693	0	Clayey and shaly siltstone	11	9	
693	0	732	0	Sandy siltstone	39	0	
732	0	750	0	Silty shaly claystone	18	0	
750	0	756	0	Lenticular sandstone and shale	6	0	
756	0	758	7	Claystone	2	7	
758	7	775	0	Shaly siltstone with scattered sandy lenses	16	5	
775	0	775	2	Coal	0	2	
775	2	777	8	Claystone	2	6	
777	8	783	2	Sandy siltstone	5	6	
783	2	785	2	Silty claystone	2	0	
785	2	798	6	Sandstone	13	4	
798	6	823	6	Shaly claystone and siltstone	25	0	
823	6	860	0	Shaly and silty claystone	36	6	
860	0	868	0	Siltstone with sandy partings	8	0	
868	0	874	0	Sandstone with lenticular clayey partings	6	0	
874	0	927	0	Siltstone with lenticular sandy partings	53	0	
927	0	935	8	Claystone; sandy lenses in the bottom	8	8	
935	8	935	10	Coal and claystone	0	2	
935	10	936	4	Bright coal	0	6	Gann coal bed
936	4	936	7	Claystone	0	3	
936	7	937	7	Coal	1	0	Higginbotham coal bed
937	7	937	10	Coaly claystone with pyrite	0	3	
937	10	938	8	Slickensided carbonaceous claystone	0	10	
938	8	939	2	Coaly claystone	0	6	

Log of core drill hole no. 21-16-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
939	2	944	0	Slickensided carbonaceous claystone; ankerite nodules	4	10	
944	0	950	0	Siltstone	6	0	
950	0	958	0	Siltstone and fine-grained cross-bedded sandstone	8	0	
958	0	964	0	Fine-grained sandstone, silty in places	6	0	
964	0	980	0	Medium-grained sandstone with scattered clay pellets and carbonized plant fragments	16	0	
980	0	982	0	Siltstone	2	0	
982	0	983	2	Claystone conglomerate with carbonized plant fragments	1	2	
983	2	984	7	Sandstone	1	5	
984	7	985	11	Claystone and claystone breccia	1	4	
985	11	1010	7	Medium- to fine-grained sandstone	24	2	
1010	1	1010	10	Coal	0	9	Fairview coal bed
1010	10	1011	0	Coaly claystone	0	2	
1011	0	1011	6	Coal	0	6	
1011	6	1011	10	Claystone	0	4	
1011	10	1013	0	Coal	1	2	
1013	0	1013	2	Coaly claystone	0	2	
1013	2	1013	3½	Coal	0	1½	
1013	3½	1015	0	Carbonaceous claystone with streaks of coal	1	8½	
				Total depth 1,015 feet.			

Log of core drill hole no. 22-15-CA

Location: 1,100 feet south and 750 feet east of the northwest corner of sec. 15, T. 15 S., R. 4 E.
Altitude: 650 feet.

0	0	6	0	Soil and weathered rock	6	0
6	0	29	2	Medium-grained cross-bedded sandstone	23	2
29	2	30	2	Claystone conglomerate	1	0
30	2	43	2	Sandstone	13	0
43	2	43	8	Claystone conglomerate with carbonized plant fragments	0	6
43	8	48	4	Claystone with streaks of coal	4	8
48	4	54	8	Siltstone and claystone	6	4
54	8	57	8	Fine-grained micaceous sandstone	3	0
57	8	65	0	Silty pyritic claystone	7	4
65	0	76	2	Claystone	11	2
76	2	83	6	Sandy micaceous siltstone	7	4
83	6	108	9	Medium-grained sandstone	25	3
108	9	111	9	Dark-gray claystone; silty partings near the bottom	3	0
111	9	120	0	Sandstone	8	3
120	0	120	3	Claystone conglomerate	0	3
120	3	129	0	Sandstone	8	9
129	0	129	8	Slickensided claystone	0	8
129	8	129	9	Coal	0	1

Log of core drill hole no. 22-15-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
129	9	129	10	Claystone	0	1	
129	10	129	11	Bony coal	0	1	
129	11	130	10	Carbonaceous claystone	0	11	
130	10	131	3	Coal	0	5	
131	3	134	0	Carbonaceous claystone	2	9	
134	0	141	6	Slickensided shaly silty claystone	7	6	
141	6	142	0	Slickensided carbonaceous claystone	0	6	
142	0	142	5	Bony coal	0	5	
142	5	142	6½	Claystone	0	1½	
142	6½	142	8	Coal	0	1½	
142	8	155	0	Slickensided claystone	12	4	
155	0	167	0	Siltstone and sandstone	12	0	
167	0	168	8	Sandstone	1	8	
168	8	173	2	Thin-bedded siltstone and sandstone	4	6	
173	2	179	8	Shaly micaceous siltstone with sandy partings	6	6	
179	8	193	9	Claystone	14	1	
193	9	198	0	Siltstone with sandy partings	4	3	
198	0	201	8	Claystone; coaly at bottom	3	8	
201	8	207	0	Siltstone	5	4	
207	0	210	4	Fine sandstone	3	4	
210	4	212	10	Claystone with silty partings	2	6	
212	10	223	0	Siltstone	10	2	
223	0	256	6	Fine- to medium-grained sandstone	33	6	
256	6	257	6	Sandstone with carbonized plant fragments and claystone pellets	1	0	
257	6	261	8	Silty claystone	4	2	
261	8	266	0	Siltstone; scattered ferruginous concretions; dip 20°	4	4	
266	0	277	7	Medium-grained sandstone	11	7	
277	7	293	9	Carbonaceous claystone	16	2	
293	9	294	0	Coal	0	3	Bibby zone of coal beds
294	0	295	2	Carbonaceous sandstone	1	2	
295	2	298	6	Claystone	3	4	
298	6	301	9	Siltstone	3	3	
301	9	347	8	Medium-grained sandstone; carbonaceous in the bottom	45	11	
347	8	354	9	Sandy siltstone; dip 9°	7	1	
354	9	363	6	Thin-bedded sandstone	8	9	
363	6	363	9	Coaly claystone	0	3	
363	9	364	0	Coal	0	3	
364	0	365	2	Slickensided carbonaceous claystone	1	2	
365	2	365	3	Coaly claystone	0	1	
365	3	366	0	Carbonaceous claystone	0	9	
366	0	369	0	Siltstone	3	0	
369	0	370	2	Claystone with ferruginous concretions	1	2	
370	2	372	2	Carbonaceous claystone	2	0	
377	2	392	3	Siltstone and sandstone	5	0	
377	2	392	2	Siltstone and sandstone	15	1	
392	3	397	0	Sandstone	4	9	
397	0	401	10	Claystone; dip 15°	4	10	
401	10	402	2	Coal	0	2	
402	0	402	10	Slickensided carbonaceous claystone	0	10	

Log of core drill hole no. 22-15-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
402	10	403	3	Slickensided carbonaceous claystone with streaks of coal	0	5	
403	3	403	11	Slickensided carbonaceous claystone	0	8	
403	11	410	0	Claystone with ankerite spherules and nodules	6	1	
410	0	424	6	Silty and shaly claystone; dip 15°	14	6	
424	6	436	8	Siltstone and claystone with silty partings	12	2	
436	8	440	3	Thin-bedded sandstone with lenticular shale partings	3	7	
440	3	464	6	Shaly and clayey siltstone with lenticular sandy partings	24	3	
464	6	470	5	Shaly claystone with silty partings	5	11	
470	5	477	10	Silty claystone with many plant fossils	7	5	
477	10	478	0	Bony coal	0	2	
478	0	479	0	Carbonaceous claystone	1	0	
479	0	479	2	Coal	0	2	Brown coal bed
479	2	479	3	Carbonaceous claystone	0	1	
479	3	479	9	Bright coal	0	6	
479	9	484	7	Slickensided carbonaceous claystone; silty in bottom	4	10	
484	7	537	6	Clayey siltstone	52	11	
537	6	541	4	Silty and shaly claystone	3	10	
541	4	549	0	Siltstone, sandy at bottom	7	8	
549	0	555	0	Thin-bedded sandstone with silty partings	6	0	
555	0	574	4	Thin-bedded siltstone with sandy partings; dip 10°	19	4	
574	4	579	8	Claystone	5	4	
579	8	629	6	Clayey siltstone	49	10	
629	6	637	0	Silty and shaly claystone	7	6	
637	0	672	0	Shaly siltstone and claystone	35	0	
672	0	734	1	Siltstone with lenticular sandy partings; dip 10°	62	1	
734	1	735	4	Coal	1	3	Gann coal bed
735	4	738	0	Slickensided carbonaceous claystone with ankerite nodules	2	8	
738	0	738	4½	Bony coal	0	4½	Higginbotham coal bed
738	4½	738	8	Slickensided carbonaceous claystone	0	3½	
738	8	738	10	Sandstone	0	2	
738	10	740	5	Slickensided carbonaceous claystone	1	7	
740	5	744	6	Siltstone	4	1	
744	6	746	6	Silty sandstone	2	0	
746	6	747	7	Sandstone	1	1	
747	7	748	1	Siltstone	0	6	
748	1	779	8	Medium-grained carbonaceous sandstone	31	7	
779	8	780	8	Claystone breccia with carbonized plant fragments	1	0	
780	8	782	0	Carbonaceous sandstone	1	4	
782	0	782	10	Claystone breccia	0	10	
782	10	785	10	Sandstone with carbonized plant fragments	3	0	

Log of core drill hole no. 22-15-CA (Continued)

Depth From Ft.	In.	To Ft.	In.	Description	Thickness Ft.	In.	
785	10	787	0	Sandstone	1	2	
787	0	789	0	Claystone with ankerite nodules	2	0	
789	0	791	0	Silty claystone	2	0	
791	0	792	3	Sandstone	1	3	
792	3	804	6	Claystone with thin partings of sandy lenses	12	3	
804	6	805	0	Siltstone	0	6	
805	0	805	9	Coal	0	9	Fairview coal bed
805	9	805	11	Coaly claystone	0	2	
805	11	806	5	Coal	0	6	
805	6	806	10	Claystone	0	5	
806	10	806	11½	Coal	0	1½	
806	11½	807	1	Claystone	0	1½	
807	1	808	0	Coal	0	11	
808	0	808	4	Coaly claystone	0	4	
808	4	814	0	Claystone	5	8	
				Total depth 814 feet.			

Log of core drill hole no. 23-29-CA

Location: 560 feet south and 1,520 feet east of the northwest corner of sec. 29, T. 15 S., R. 4 E.
Altitude: 575 feet.

0	0	21	6	Soil and weathered rock	21	6	
21	6	27	8	Light-gray shaly claystone with silty lenticular partings; dip 15°	6	2	
27	8	27	11	Coal	0	3	
27	11	35	6	Clay and claystone	7	7	
35	6	35	9	Coal	0	3	Brown coal bed
35	9	41	7	Clay	5	10	
41	7	44	10	Siltstone	3	3	
44	10	55	0	Carbonaceous claystone	10	2	
55	0	66	6	Sandy siltstone	11	6	
66	6	71	1	Siltstone with lenticular sandy partings	4	7	
71	1	78	1	Claystone with silty lenses and partings and ferruginous concretions	7	0	
78	1	88	6	Claystone with scattered ferruginous concretions	10	5	
88	6	100	0	Claystone with lenticular silty partings and ferruginous concretions; dip 15°	11	6	
100	0	105	6	Claystone	5	6	
105	6	106	6	Siltstone	1	0	
106	6	110	0	Silty claystone	3	6	
110	0	115	0	Claystone with lenticular silty partings	5	0	
115	0	118	0	Siltstone with sandy partings	3	0	
118	0	121	0	Claystone	3	0	
121	0	124	0	Siltstone	3	0	
124	0	140	0	Carbonaceous claystone	16	0	
140	0	141	0	Siltstone	1	0	
141	0	154	6	Claystone with plant fossils	13	6	
154	6	155	6	Siltstone	1	0	

Log of core drill hole no. 23-29-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
155	6	157	0	Sandstone	1	6	
157	0	167	6	Thin-bedded siltstone with claystone partings	10	6	
167	6	169	8	Siltstone with sandy lenticular partings	2	2	
169	8	174	8	Siltstone	5	0	
174	8	176	2	Thin-bedded siltstone and sandstone	1	6	
176	2	191	2	Sandy siltstone; dip 15°	15	0	
191	2	219	6	Clayey and shaly siltstone	28	4	
219	6	238	0	Silty claystone with scattered lenticular sandy partings	18	6	
238	0	298	2	Silty claystone with ferruginous concretions and lenticular sandy partings	60	2	
298	2	299	2	Coal	1	0	) Gann coal bed
299	2	299	8	Claystone	0	6	
299	8	318	11	Siltstone	19	3	
318	11	319	1	Coal	0	2	} Higginbotham coal bed
319	1	319	2	Claystone	0	1	
319	2	319	5½	Coal	0	3½	
319	5½	319	8½	Coaly claystone	0	3	
319	8½	320	9	Slickensided carbonaceous claystone	1	0½	
320	9	321	10	Sandstone	1	1	
321	10	325	4	Carbonaceous claystone with ankerite nodules	3	6	
325	4	329	6	Siltstone and fine-grained sandstone	4	2	
329	6	331	6	Claystone	2	0	
331	6	350	0	Sandstone	18	6	
350	0	353	0	Carbonaceous sandstone with claystone pellets	3	0	
353	0	354	10	Sandstone	1	10	
354	10	355	3	Sandstone with claystone pellets	0	5	
355	3	355	6	Ferruginous siltstone	0	3	
355	6	356	1	Sandstone with claystone pellets	0	7	
356	1	356	4	Siltstone and sandstone	0	3	
356	4	368	4	Carbonaceous sandstone with claystone pellets and fossilized plants	12	0	
368	4	369	2	Claystone conglomerate with carbonized plant fragments	0	10	
369	2	375	2	Claystone	6	0	
375	2	378	5	Siltstone	3	3	
378	5	381	0	Carbonaceous sandstone; dip 15°	2	7	
381	0	390	8	Shaly claystone with thin sandy partings	9	8	
390	8	391	5	Coal	0	9	} Fairview coal bed
391	5	391	6½	Coaly claystone	0	1½	
391	6½	391	10½	Coal	0	4	
391	10½	391	11	Bony coal	0	0½	
391	11	392	1	Claystone	0	2	
392	1	393	0½	Coal (10½" core recovered)	0	11½	
393	0½	393	3	Coaly claystone (1½" core recovered)	0	2½	
393	3	398	0	Slickensided carbonaceous claystone	4	9	
				Total depth 398 feet.			

Log of core drill hole no. 24-16-CA

Location: 740 feet north and 1,550 feet east of the southwest corner of sec. 16, T. 15 S., R. 4 E.

Altitude: 645 feet.

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
0	0	31	0	Soil, weathered clay, and sandstone	31	0	
31	0	51	0	Medium-grained carbonaceous sandstone	20	0	
51	0	52	0	Claystone	1	0	
52	0	53	0	Siltstone	1	0	
53	0	63	0	Sandstone; dip 15°	10	0	
63	0	70	3	Slickensided carbonaceous claystone	7	3	
70	3	72	6	Clayey siltstone	2	3	
72	6	76	0	Light-gray silty claystone	3	6	
76	0	93	0	Light-gray claystone	17	0	
93	0	95	0	Siltstone	2	0	
95	0	105	10	Sandstone	10	10	
105	10	106	6	Siltstone	0	8	
106	6	108	0	Sandstone	1	6	
108	0	111	6	Light-gray claystone	3	6	
111	6	112	9	Carbonaceous claystone	1	3	
112	9	113	3	Coaly claystone	0	6	
113	3	116	0	Claystone	2	9	
116	0	119	6	Claystone with ankerite spherules	3	6	
119	6	122	0	Claystone with ankerite nodules	2	6	
122	0	138	0	Shaly and silty claystone	16	0	
138	0	141	8	Sandstone and siltstone	3	8	
141	8	146	6	Fine-grained carbonaceous sandstone	4	10	
146	6	149	6	Sandy siltstone	3	0	
149	6	158	0	Sandstone	8	6	
158	0	171	0	Sandstone with streaks of coal	13	0	
171	0	173	6	Carbonaceous claystone	2	6	
173	6	187	6	Claystone with scattered silty lenses and partings and ferruginous concretions	14	0	
187	6	187	11½	Slickensided carbonaceous claystone with streaks of coal	0	5½	
187	11½	188	1½	Coaly claystone	0	2	
188	1½	188	8	Coal	0	6½	Brown coal bed
188	8	190	10	Carbonaceous claystone	2	2	
190	10	198	6	Carbonaceous shaly siltstone with thin lenticular sandy partings	7	8	
198	6	207	4	Silty claystone	8	10	
207	4	220	6	Claystone and fine sandstone in thin lenticu'ar beds	13	2	
220	6	226	0	Siltstone	5	6	
226	0	240	6	Shaly and silty claystone	14	6	
240	6	250	6	Shaly claystone with ferruginous concretions	10	0	
250	6	257	9	Shaly claystone with sandy lenses	7	3	
257	9	263	0	Thin-bedded sandstone and siltstone	5	3	
263	0	275	0	Sandy and shaly siltstone	12	0	
275	0	280	6	Siltstone with sandy lenticular partings	5	6	
280	6	283	6	Carbonaceous claystone	3	0	
283	6	286	0	Siltstone	2	6	
286	0	291	0	Fine-grained sandstone with thin silty partings	5	0	
291	0	294	0	Siltstone and claystone	3	0	

Log of core drill hole no. 24-16-CA (Continued)

Depth From Ft.	Depth From In.	Depth To Ft.	Depth To In.	Description	Thickness Ft.	Thickness In.	
294	0	302	6	Sandstone	8	6	
302	6	313	6	Thin-bedded lenticular siltstone and sandstone	11	0	
313	6	322	6	Sandy siltstone	9	0	
322	6	330	0	Silty and shaly claystone	7	6	
330	0	333	0	Mudstone	3	0	
333	0	339	6	Siltstone	6	6	
339	6	398	0	Silty and shaly claystone	58	6	
398	0	424	10	Thin-bedded claystone with sandy lenticular partings	26	10	
424	10	425	1	Coal	0	3	) Gann coal bed
425	1	425	2	Coaly claystone	0	1	
425	2	425	3½	Coal	0	1½	
425	3½	425	5	Silty claystone	0	1½	
425	5	429	6	Siltstone	4	1	
429	6	444	6	Silty claystone; dip 12°	15	0	
444	6	444	8	Claystone	0	2	
444	8	445	5	Bright coal	0	9	) Higginbotham coal bed
445	5	446	10	Slickensided carbonaceous claystone	1	5	
446	10	447	1	Claystone with streaks of coal	0	3	
447	1	448	5	Slickensided carbonaceous claystone	1	4	
448	5	452	0	Carbonaceous claystone with ankerite nodules	3	7	
452	0	463	0	Siltstone and sandstone	11	0	
463	0	465	0	Fine-grained silicinate sandstone	2	0	
465	0	482	0	Fine- to medium-grained slightly carbonaceous sandstone	17	0	
482	0	487	7	Fine- to medium-grained sandstone with scattered pellets of claystone and carbonized plant fragments	5	7	
487	7	488	0	Claystone	0	5	
488	0	497	6	Sandstone	9	6	
497	6	498	6	Claystone breccia with sandy matrix	1	0	
498	6	499	6	Sandstone	1	0	
499	6	503	4	Carbonaceous siltstone	3	10	
503	4	506	0	Claystone	2	8	
506	0	508	0	Claystone conglomerate with sand matrix and carbonized plant fragments	2	0	
508	0	510	0	Sandstone with claystone conglomerate at the base	2	0	
510	0	515	5	Silty claystone	5	5	
515	5	515	9	Coal	0	4	)
515	9	515	9¼	Claystone	0	0¼	)
515	9¼	516	8	Coal	0	10¾	} Fairview
516	8	516	11	Carbonaceous claystone	0	3	) coal bed
516	11	518	0	Coal	1	1	)
518	0	518	3	Coaly claystone	0	3	
518	3	522	0	Claystone	3	9	

Total depth 522 feet.

GEOLOGICAL SURVEY OF ALABAMA

WALTER B. JONES, State Geologist

BULLETIN 61

PART II

GEOLOGY AND COAL RESOURCES OF THE NORTHEAST PART OF THE COOSA COAL FIELD, ST. CLAIR COUNTY, ALABAMA

By

HOWARD E. ROTHROCK

Geologist, U. S. Geological Survey

Prepared by the

UNITED STATES GEOLOGICAL SURVEY

in cooperation with the

GEOLOGICAL SURVEY OF ALABAMA

Plate 1. Geologic map of a part of the Coosa coal field, and adjacent areas, St. Clair County, Alabama.

Plate 2. Maps and structure sections of the Coal City and Fairview basins, Coosa coal field, St. Clair County, Alabama.

Plate 3. Cross sections through core drill holes, Coosa coal field, St. Clair County, Alabama.

Plate 4. Map and sections of the Upper Chapman coal bed.

Plate 5. Map and sections of the Fairview coal bed.

Plate 6. Map of the Gann coal bed.

Plate 7. Map and sections of the Marion coal bed.

Plate 8. Map and sections of the Broken Arrow coal bed.

Plate 9. Map and sections of the Coal City coal bed.

Plate 10. Map and sections of the Hammond coal bed.

UNIVERSITY OF ALABAMA

1949

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GEOLOGICAL SURVEY

PLATE 2

EXPLANATION

COAL BEDS

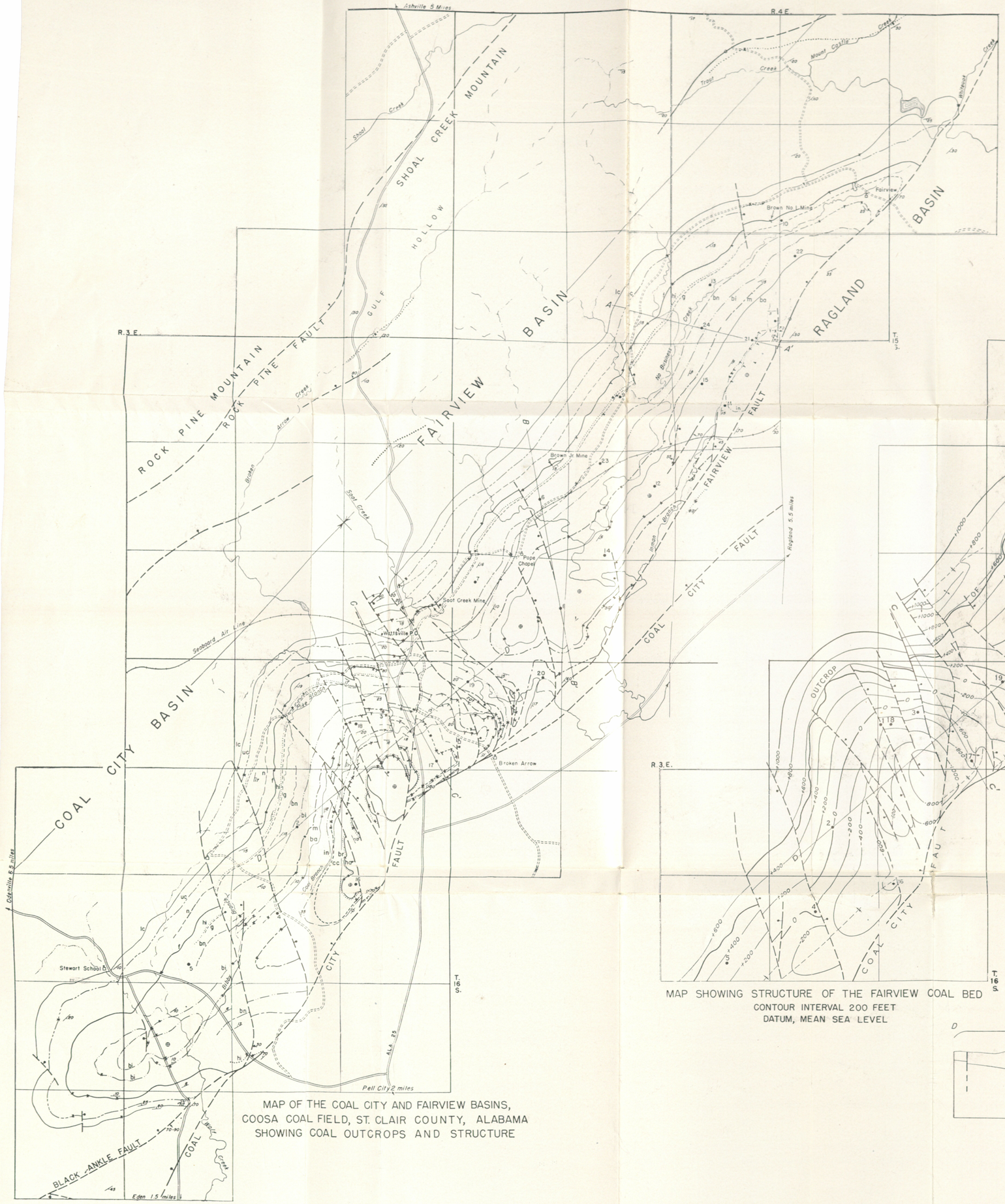
- ha — Hammond
- br — Brewer
- cc — Coal City
- in — Inman
- ba — Broken Arrow
- m — Marion
- bi — Bibby
- bn — Brown
- g — Gann
- hi — Higginbotham
- f — Fairview
- n — New
- uc — Upper Chapman
- lc — Lower Chapman
- Local

WORKINGS

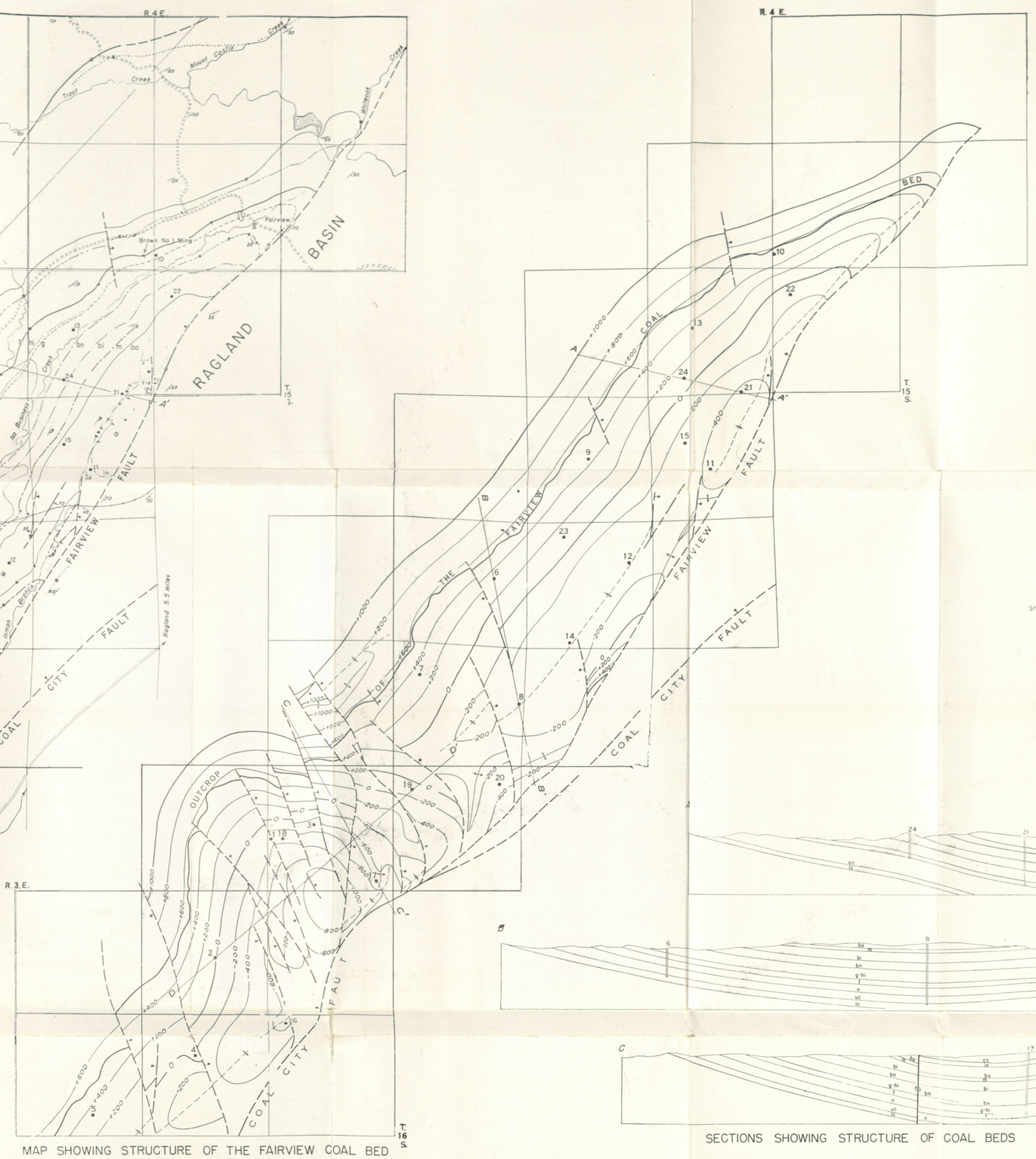
- Small coal prospect, outcrop or bloom of coal
- Portal of slope mine (Fairview coal measured at numbered localities)
- Strip mine
- 20 — Diamond drill hole

STRUCTURE SYMBOLS

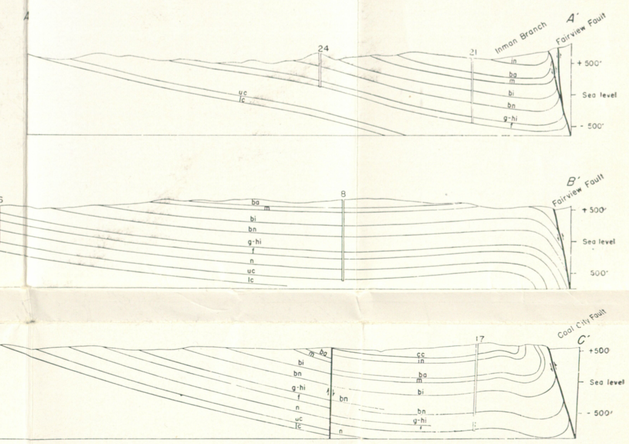
- Fault, showing dip (7) and downthrown side (T); dashed where concealed
- Vertical fault
- Strike and dip of bed
- Strike of vertical bed
- Strike and dip of overturned bed
- Horizontal bed
- Anticlinal fold
- Synclinal fold



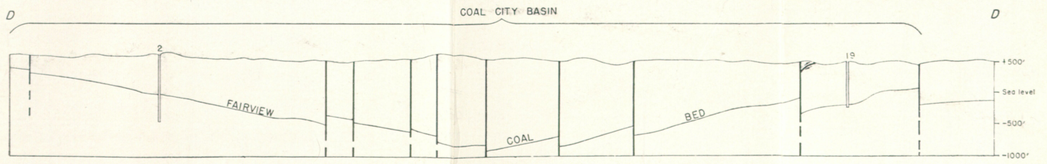
MAP OF THE COAL CITY AND FAIRVIEW BASINS, COOSA COAL FIELD, ST. CLAIR COUNTY, ALABAMA SHOWING COAL OUTCROPS AND STRUCTURE



MAP SHOWING STRUCTURE OF THE FAIRVIEW COAL BED
CONTOUR INTERVAL 200 FEET
DATUM, MEAN SEA LEVEL



SECTIONS SHOWING STRUCTURE OF COAL BEDS



SECTION SHOWING STRUCTURE OF FAIRVIEW COAL BED

Horizontal Scale of Cross Sections
0 1/4 1/2 3/4 MILE

MAPS AND STRUCTURE SECTIONS OF THE COAL CITY AND FAIRVIEW BASINS COOSA COAL FIELD, ST. CLAIR COUNTY, ALABAMA

BY
HOWARD E. ROTHROCK

0 1/4 1/2 3/4 1 2 MILES
5,000 4,000 3,000 2,000 1,000 0 5,000 FEET

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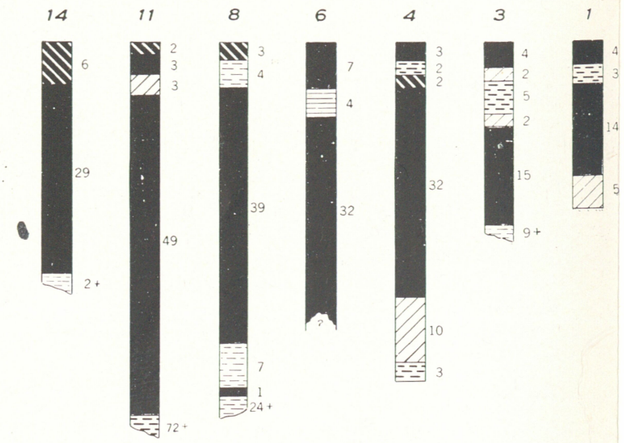
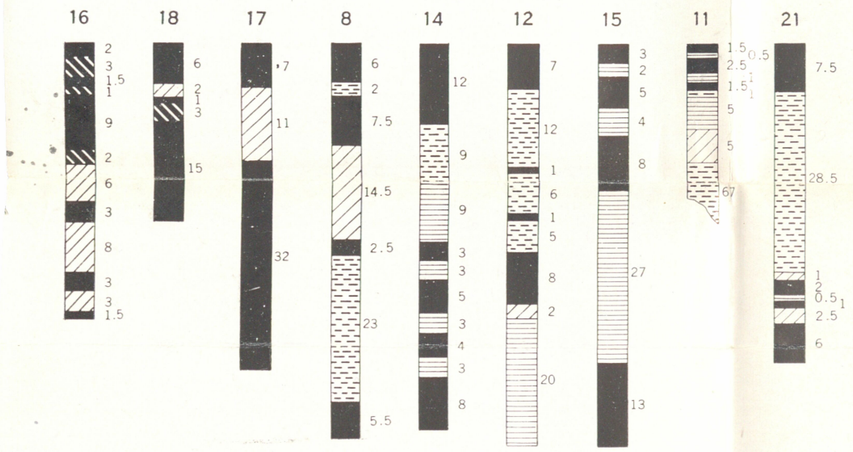
GEOLOGICAL SURVEY

PLATE 8

Coal sections along the outcrop



Coal sections in diamond drill holes



EXPLANATION

SYMBOLS USED ON THE MAP

A

Area beneath which the Broken Arrow coal is 14 or more inches thick. The area is divided into segments, lettered "A," "B," etc., for the purpose of computing and classifying the coal reserves

Area beneath which the Broken Arrow coal is less than 14 inches thick or beneath which its thickness is unknown

Area thought to be mined out

2x

Prospect pit or outcrop

5>

Portal of slope mine

17

U. S. Bureau of Mines diamond drill hole to the Broken Arrow coal bed

Fault
(Transverse faults are shown only where they offset the outcrop or limit the bed underground)

Outcrop of coal

SYMBOLS USED ON THE COAL SECTIONS

Coal

Bony or clayey coal or rash

Coaly claystone or claystone with streaks of coal

Carbonaceous claystone

Claystone

Clay

The thicknesses of the beds are shown in inches at the right of the sections

MAP AND SECTIONS OF THE BROKEN ARROW COAL BED

BY
HOWARD E. ROTHROCK

1 ½ 0 1 Mile

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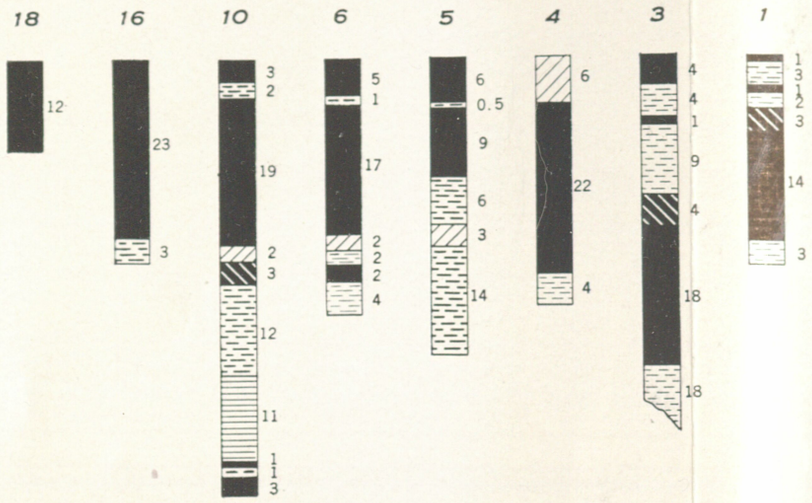
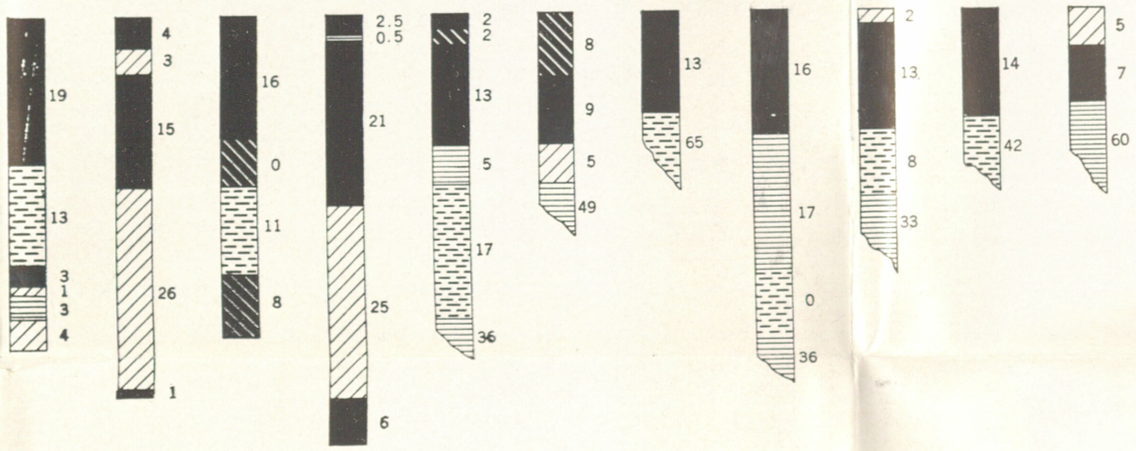
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

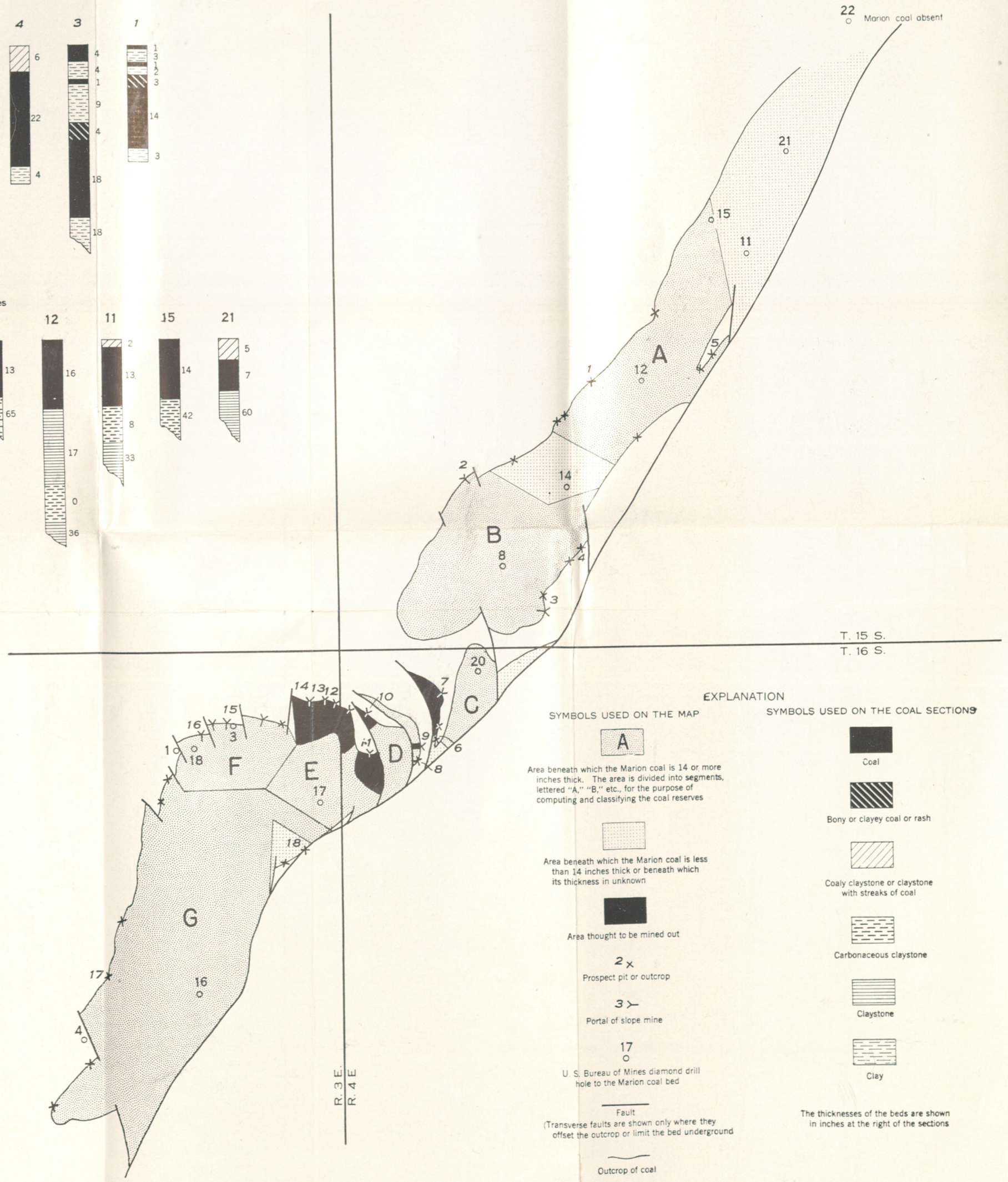
PLATE 7

Coal sections along the outcrop



Coal sections in diamond drill holes





EXPLANATION

SYMBOLS USED ON THE MAP

A

Area beneath which the Marion coal is 14 or more inches thick. The area is divided into segments, lettered "A," "B," etc., for the purpose of computing and classifying the coal reserves

Area beneath which the Marion coal is less than 14 inches thick or beneath which its thickness in unknown

Area thought to be mined out

2 ×
Prospect pit or outcrop

3 ⊱
Portal of slope mine

17
U. S. Bureau of Mines diamond drill hole to the Marion coal bed

Fault
(Transverse faults are shown only where they offset the outcrop or limit the bed underground

Outcrop of coal

SYMBOLS USED ON THE COAL SECTIONS

Coal

Bony or clayey coal or rash

Coaly claystone or claystone with streaks of coal

Carbonaceous claystone

Claystone

Clay

The thicknesses of the beds are shown in inches at the right of the sections

MAP AND SECTIONS OF THE MARION COAL BED

BY
HOWARD E. ROTHROCK

1 ½ 0 1 Mile

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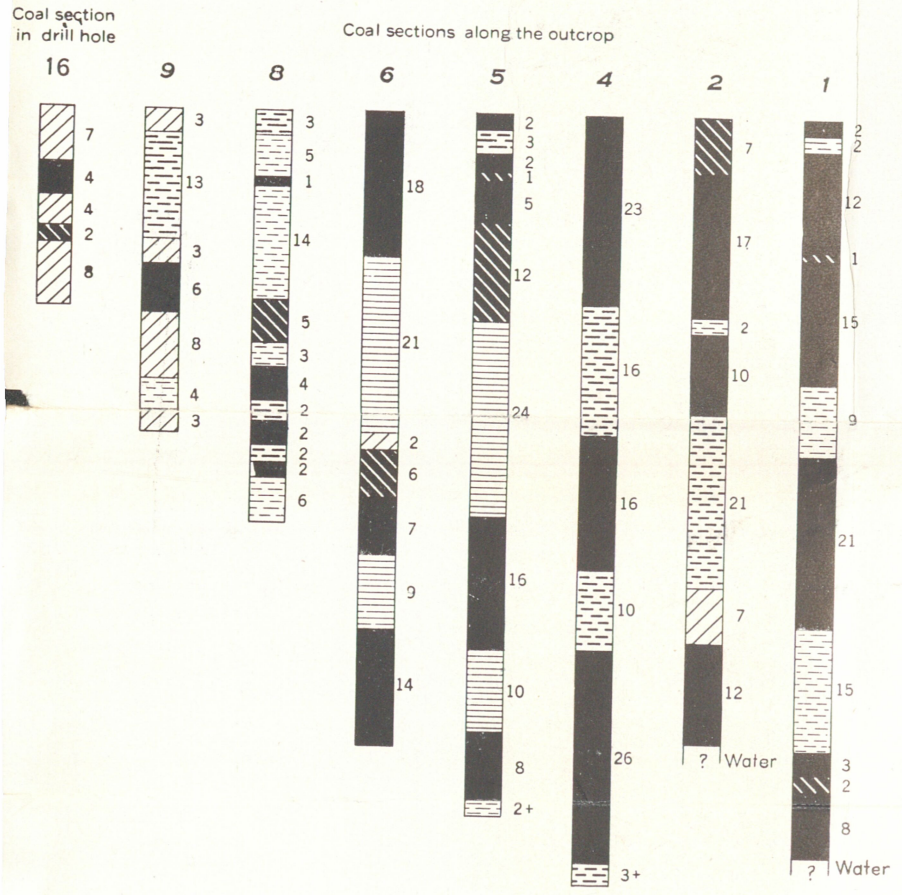
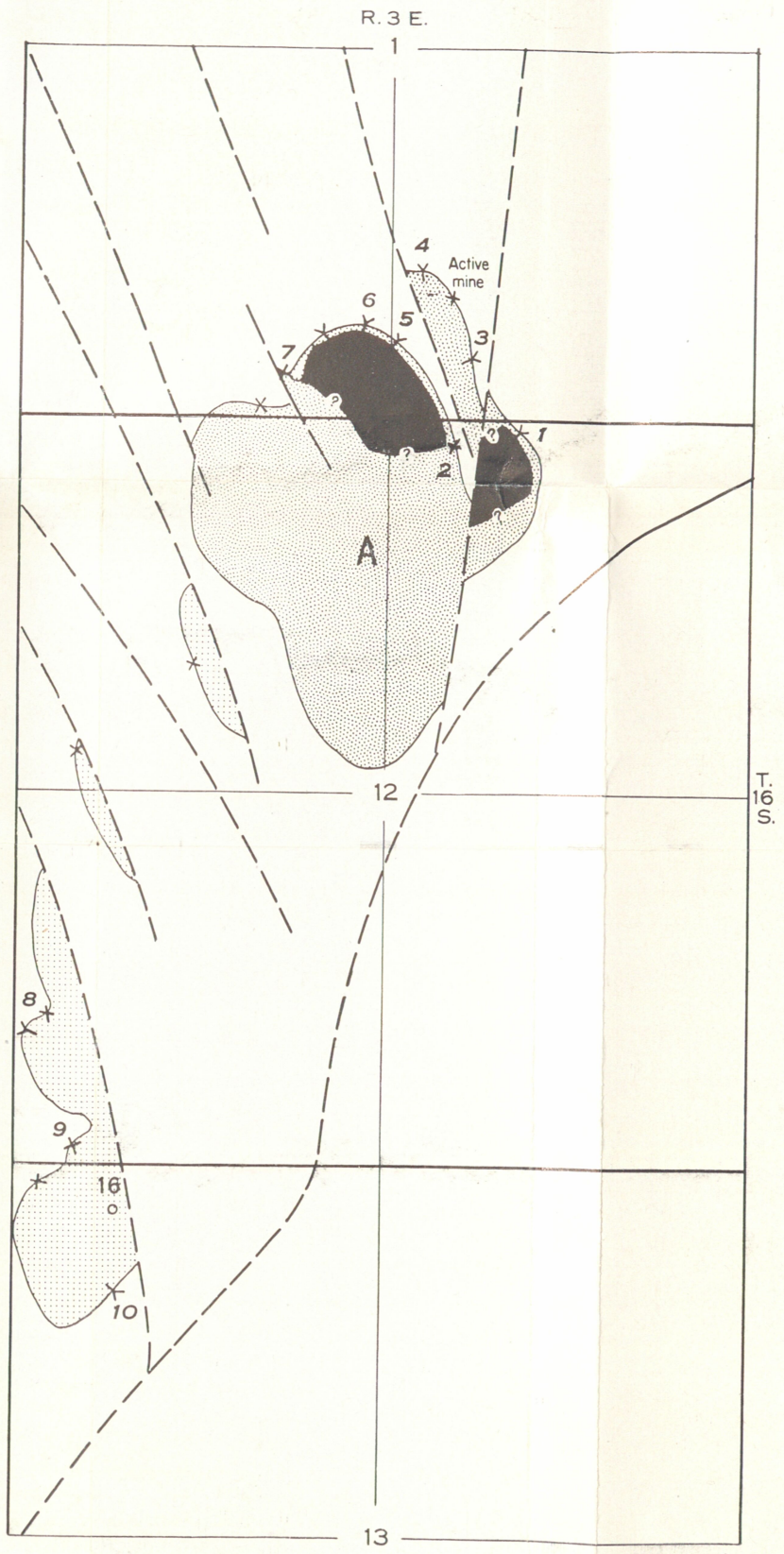
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PLATE 10





EXPLANATION

SYMBOLS USED ON THE MAP

A

Area beneath which the Hammond coal is 14 or more inches thick. Block "A" constitutes the minable reserves in this bed

Area beneath which the Hammond coal is less than 14 inches thick or beneath which its thickness is unknown

Area thought to be mined out

2x
Prospect pit or outcrop

3>
Portal of slope mine

16
U. S. Bureau of Mines diamond drill hole to the Hammond coal bed

Fault
(Dashed where concealed)

Outcrop of coal

Strip pit

SYMBOLS USED ON THE COAL SECTIONS

Coal

Bony or clayey coal or rash

Coaly claystone or claystone with streaks of coal

Carbonaceous claystone

Claystone

Clay

The thicknesses of the beds are shown in inches at the right of the sections

MAP AND SECTIONS OF THE HAMMOND COAL BED

BY
HOWARD E. ROTHROCK

0 500 1000 2000 3000 4000 5000 Feet

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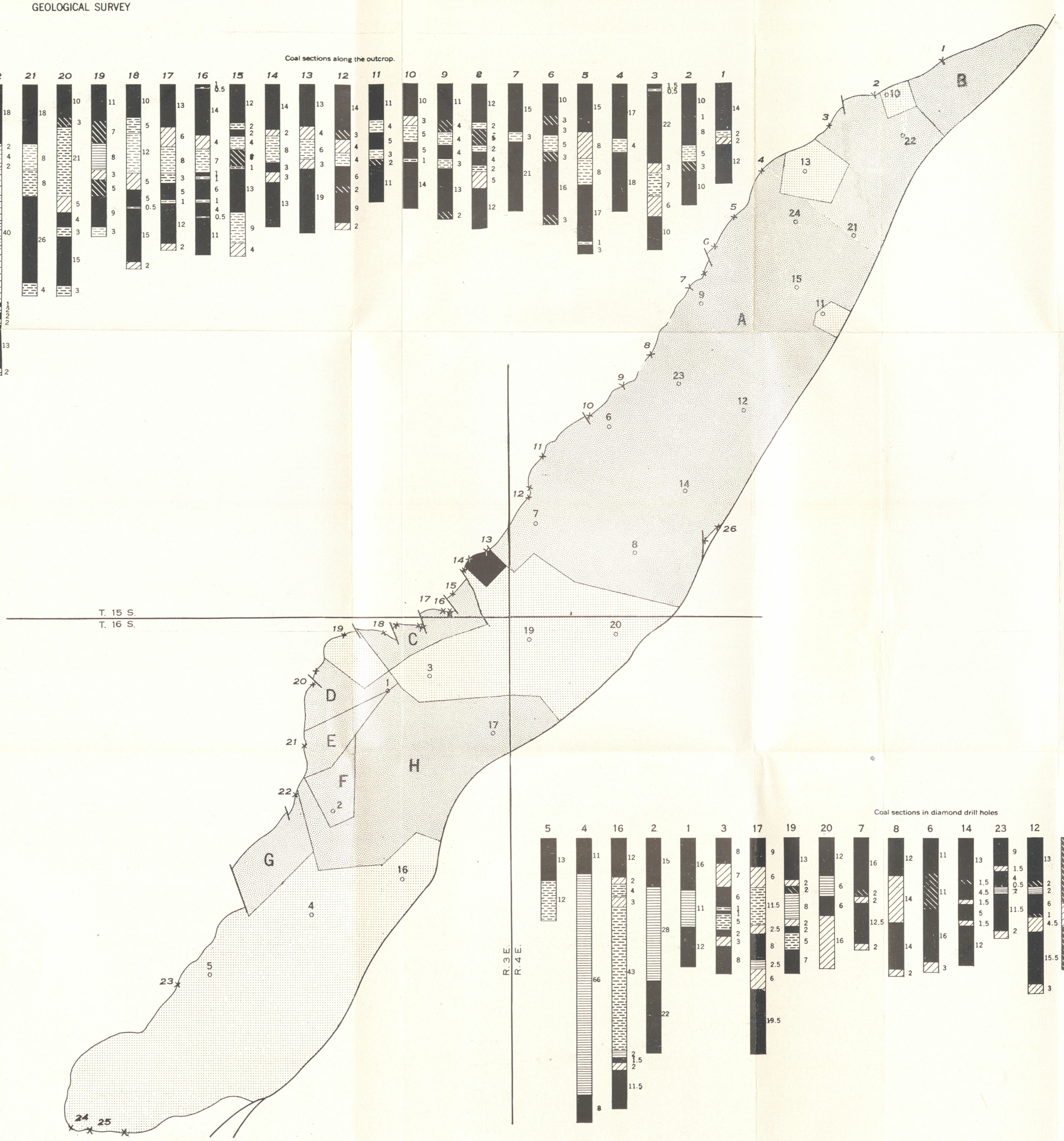
GEOLOGICAL SURVEY

PLATE 5

Coal sections along the outcrop.



EXPLANATION

SYMBOLS USED ON THE MAP

A

Area beneath which the Fairview coal is 14 or more inches thick. The area is divided into segments lettered "A," "B," and "C," for the purpose of computing and classifying the coal reserves

Area beneath which the Fairview coal is less than 14 inches thick or beneath which its thickness is unknown

Area thought to be mined out

2× Prospect pit or outcrop

3 Portal of slope mine

17 U. S. Bureau of Mines diamond drill hole to the Fairview coal bed

Fault
(Transverse faults are shown only where they offset the outcrop or limit the bed underground)

Outcrop of coal

SYMBOLS USED ON THE COAL SECTIONS

Coal

Bony or clayey coal or rash

Coaly claystone or claystone with streaks of coal

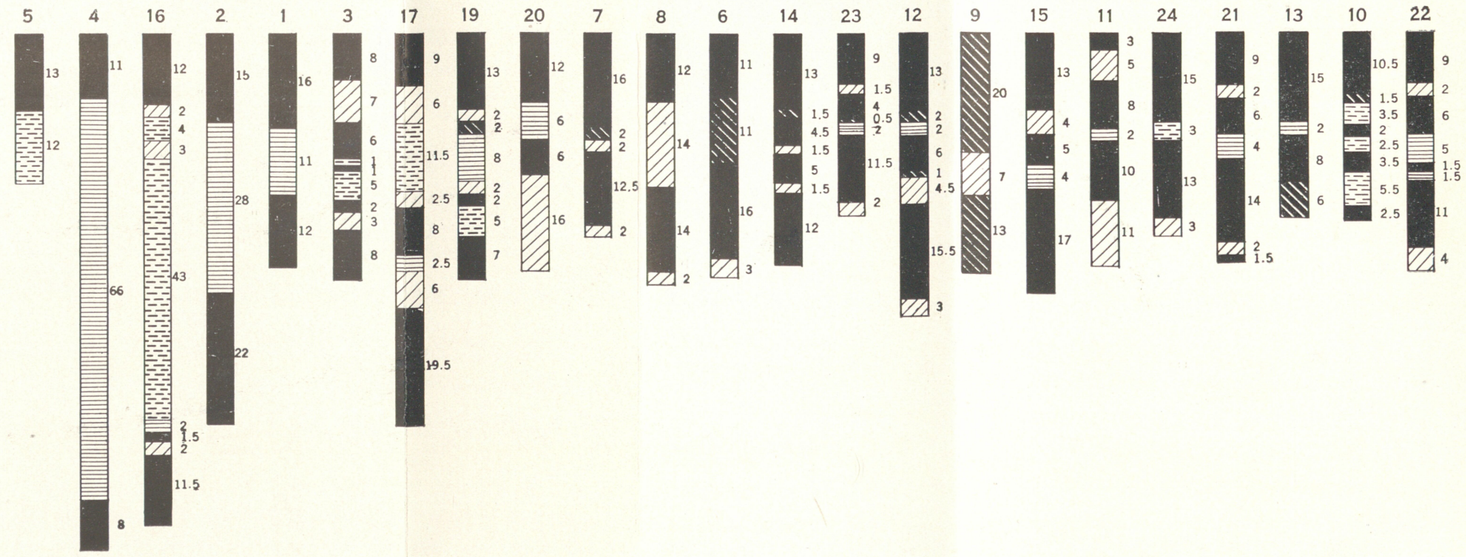
Carbonaceous claystone

Claystone

Clay

The thicknesses of the beds are shown in inches at the right of the sections

Coal sections in diamond drill holes



MAP AND SECTIONS OF THE FAIRVIEW COAL BED

BY
HOWARD E. ROTHROCK

1 Mile ½ 0 1

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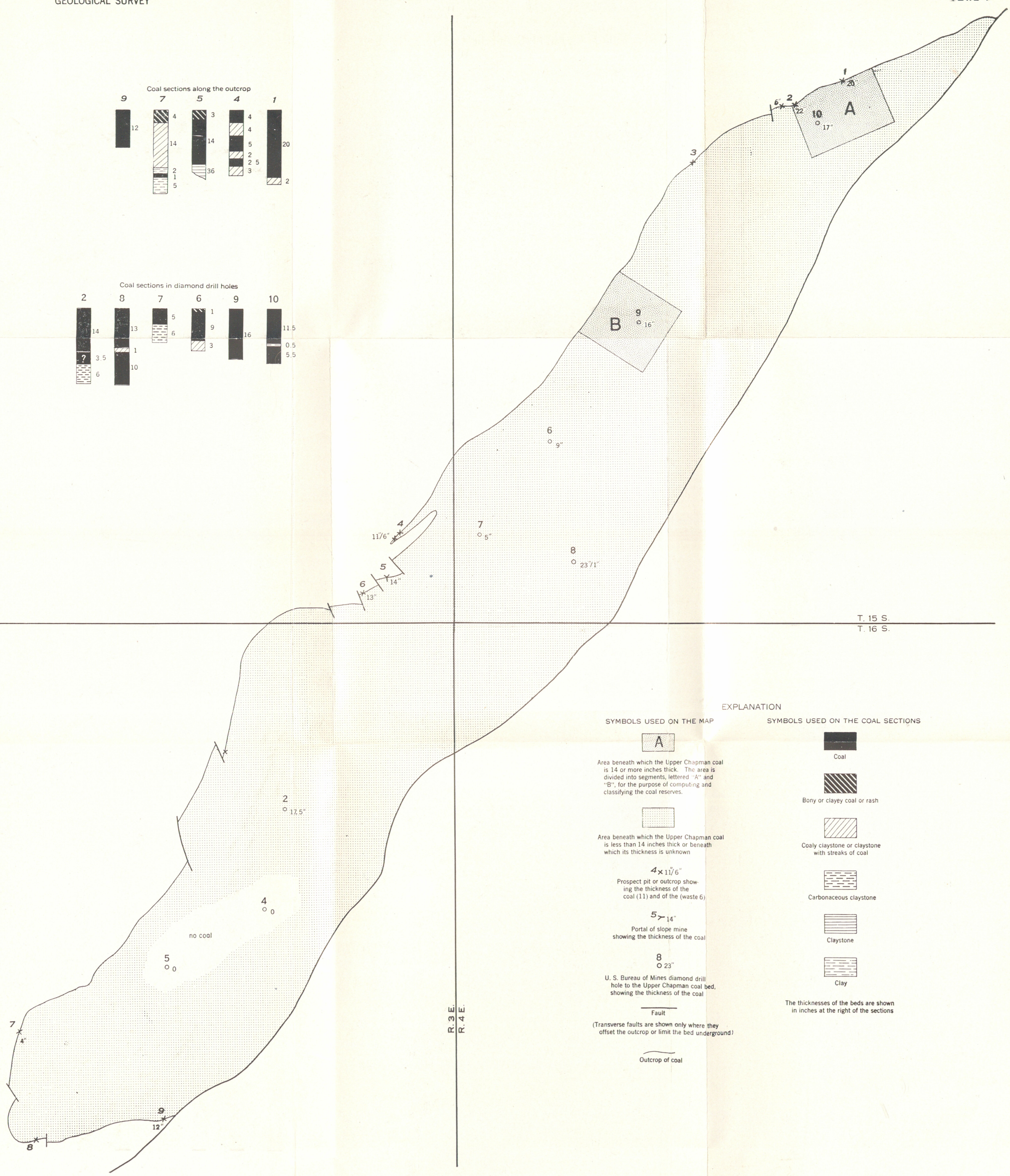
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PLATE 4

Coal sections along the outcrop

Coal sections in diamond drill holes



EXPLANATION

SYMBOLS USED ON THE MAP

A

Area beneath which the Upper Chapman coal is 14 or more inches thick. The area is divided into segments, lettered "A" and "B", for the purpose of computing and classifying the coal reserves.

Area beneath which the Upper Chapman coal is less than 14 inches thick or beneath which its thickness is unknown

4 × 11"/6"
Prospect pit or outcrop showing the thickness of the coal (11) and of the (waste 6)

5 > 14"
Portal of slope mine showing the thickness of the coal

8
○ 23"
U. S. Bureau of Mines diamond drill hole to the Upper Chapman coal bed, showing the thickness of the coal

Fault
(Transverse faults are shown only where they offset the outcrop or limit the bed underground)

Outcrop of coal

SYMBOLS USED ON THE COAL SECTIONS

Coal

Bony or clayey coal or rash

Coaly claystone or claystone with streaks of coal

Carbonaceous claystone

Claystone

Clay

The thicknesses of the beds are shown in inches at the right of the sections

MAP AND SECTIONS OF THE UPPER CHAPMAN COAL BED

BY
HOWARD E. ROTHROCK

1 ½ 0 1 Mile

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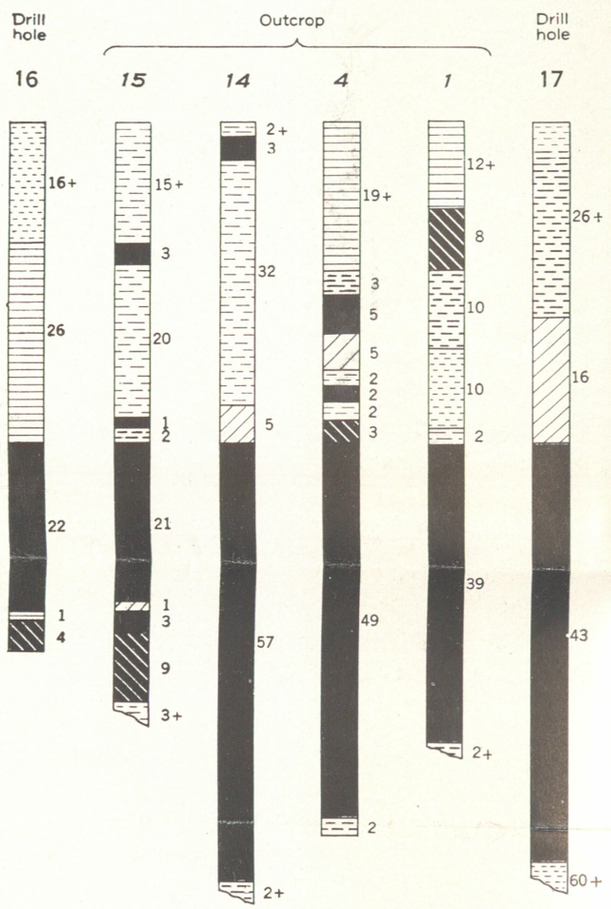
GEOLOGICAL SURVEY

PLATE 9

Coal sections in drill holes and along the outcrop



EXPLANATION

SYMBOLS USED ON THE MAP

A

Area beneath which the Coal City coal is 14 or more inches thick. The area is divided into segments, lettered "A," "B," and "C," for the purpose of computing and classifying the coal reserves

Area beneath which the Coal City coal is less than 14 inches thick or beneath which its thickness is unknown

Area thought to be mined out

2x
Prospect pit or outcrop

3
Portal of slope mine

16
U. S. Bureau of Mines diamond drill hole to the Coal City coal bed

Fault
(Dashed where concealed)

Outcrop of coal

Strip pit

SYMBOLS USED ON THE COAL SECTIONS

Coal

Bony or clayey coal or rash

Coaly claystone or claystone with streaks of coal

Carbonaceous claystone

Claystone

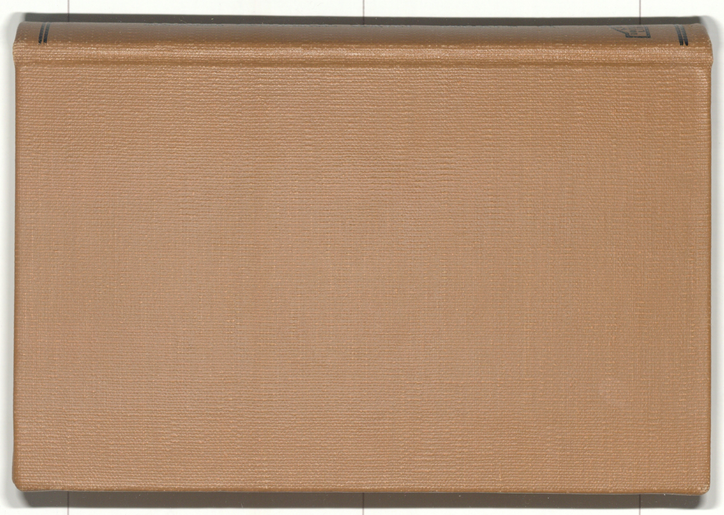
Clay

Siltstone

The thicknesses of the beds are shown in inches at the right of the sections

MAP AND SECTIONS OF THE COAL CITY COAL BED

BY
HOWARD E. ROTHROCK

0 500 1000 2000 3000 4000 5000 Feet

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